RAILROAD GAZETTE

FRIDAY, MAY 30, 1902.

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Maximum Moments and Wheel Loads.

In our issue of May 23, page 373, appeared a valuable article under the above title. The author of this article is Professor Malverd A. Howe, of the Rose Polytechnic Institute. Through some singular lapse of intelligence and vigilance the name of the author did not appear with the article.

Contributions

Why Use the Quick Triple Action Valve?

Burlington & Missouri River Railroad. }
Lincoln, Neb., May 1, 1902. }

TO THE EDITOR OF THE RAILROAD GAZETTE.

I have seen in your paper a number of interesting articles on the problem of maintenance of air-brake equipment and in reading these articles have noticed that the writers have dwelt a great deal on the sensitive construction of the quick-action triple valve and the great care required in cleaning and repairing them; all of which means expense.

I have, for a long time, questioned the necessity of a quick-action triple in order to make up a valuable braking equipment on freight cars, and, from my point of view, am unable to see where the benefits derived from the quick-action triple on freight cars are worth the extra expense and the damage done to cars and freight by its involuntary action. It has been my experience that a great deal of damage is done to persons and property by the rough handling of air-brakes on freight trains, which, no doubt, in many cases occurs from the improper handling of the brake; yet the fact that the quick action triple works involuntarily, from one cause or another, furnishes the engineman with an excuse that it is the defective triple and not his manner of handling the brakes, that causes damage.

The advantages and disadvantages of the triple valve may have been discussed in your paper, but if they have I have not seen the articles. I would like to see this matter brought up in your columns and I shall be glad to give other reasons why, in my judgment, the quick-action triple should be discarded from freight cars.

E. BIGNELL, *Superintendent.*

[Some comment on this letter will be found on the editorial pages.—EDITOR.]

Convention of the American Society of Civil Engineers.

The Summer Convention of the American Society of Civil Engineers, which was held at Washington last week, was probably the most largely attended of any convention in the history of the organization. The prospect when we last heard was that 800 members and guests would be enrolled. The weather was fine, the attractions of the place are numerous, and the local committee had arranged an excellent programme.

This being the fiftieth year of the life of the Society, the Secretary presented at the opening session a sketch of the history of the Society, and the President delivered an address of singular dignity and breadth of thought. Both the sketch and the address we shall hope to print in full shortly.

On the afternoon of Tuesday the meeting of the Committee on Rails was held, Mr. Bouscaren, the Chairman, presiding. All but three of the 12 members of the committee were present; and the committee organized by electing Mr. Robert W. Hunt as Secretary.

The evening session on the first day was given to talks on local engineering matters, illustrated by lantern slides. The most important of these were the talk on the District government, by Colonel Black, U. S. A., and on the Washington Monument and the Library Building, by Mr. Bernard R. Green. Colonel Black explained, at considerable length, the theory and working of the District government, which appears to be about the best example of municipal government that we have on the continent. Mr. Green told many important things about the Washington monument which do not appear to have ever got into print.

On the morning of Wednesday the President of the United States received the members of the Society at the White House.

The morning session was a business meeting. The committee on Regulation of Engineering Practice made a long and scholarly report, which will probably stand for some years as a pretty conclusive document in the discussion of this matter which is sure to come up periodically. The upshot of the report was the recommendation that no steps be taken looking toward legal regulation of the engineering profession. This report was adopted.

The committee on Proposed Amendments relative to Classification in the "Blue List," and relative to raising the Requirements for Membership, reported, and the report was received for further action. This report is printed in full below.

The question of time and place of the next Convention was taken up in the business meeting, and it was found that the majority of votes received by letter was in favor of Cleveland. The Convention referred the matter to the Board of Direction (as is customary), with the statement that it was the sense of this Convention that the next Summer Convention be held at Asheville, North Carolina.

The afternoon was given to an excursion to the Navy Yard, and the evening to topical discussion.

Thursday was given up to an excursion to Washington Barracks, Fort Washington, and Mount Vernon, and in the evening there were further topical discussion and an informal dance.

Friday was left entirely free for local excursions and visiting, and in the evening there was a brilliant and largely attended reception at the Corcoran Gallery of Art.

REPORT OF A COMMITTEE ON CLASSIFICATION OF APPLICANTS FOR MEMBERSHIP AND ON RAISING THE STANDARD OF QUALIFICATIONS FOR MEMBERSHIP.

At the Annual Meeting of the American Society of Civil Engineers, held Jan. 15 and 16, 1902, the following resolutions were adopted:

(1) Resolved, That it is the sense of this meeting that the Board of Direction shall have the power to classify applicants before their names appear on any published list of candidates; and further

Resolved, That a Committee be appointed to report an amendment to the Constitution which shall embody this idea, at the next Annual Convention for consideration.

(2) Resolved, That a Committee be appointed to report to the next Annual Convention upon raising the standard of qualifications for the several grades of membership.

The President of the Society appointed the undersigned as a committee to report under the provisions of these resolutions, at the Annual Convention to be held May 20, and that Committee has the honor to report as follows:

(1) Under the present procedure the applicant for membership designates in his application the grade of membership into which he wishes to be elected. It is not material to consider now whether or not the Constitution requires such designation. The practice is established. His name goes out to the Society on the "blue list" as a candidate for membership in such grade. This also is established practice although apparently not necessary under the Constitution. Not less than 20 days after the issue of the "blue list" the Board considers each application and may, at its discretion, request the candidate to consent to re-classification; and finally may direct that the name go to ballot.

(2) A committee which reported at the last Annual Meeting found that in the last ten years 32 candidates, who had been rejected by the Society on the secret ballot, had asked for re-consideration and had been voted upon by the signed ballot known as "the pink ballot." Of these 32, 19 were elected and 13 were defeated. These occurrences have caused some dissatisfaction with the present procedure and the committee which reported at the Annual Meeting thought it probable that if the candidates were classified by the Board of Direction the number of rejections would be greatly diminished.

(3) Those who have served in the Board are well aware that it is often expedient and desirable to ask a candidate to submit to a lower classification, and sometimes to accept a higher classification. But it is believed that many men would be reluctant to accept a classification lower than the one in which they have been rated in their first public appearance as candidates, namely, in the "blue list." It seems wise and politic that no public rating of candidates should be made until the Board has decided on the application of each candidate. But this decision cannot be made until that information has been gathered to collect which the "blue list" is issued.

The Board has ample power now to classify candidates, as it may, at its own discretion, decline to pass a candidate to ballot in any one grade; but the Constitution has been construed to provide that the applicant shall himself designate the class to which he wishes to be elected or transferred, and the official forms of application have been made in accordance with this reading of the Constitution.

Furthermore, the practice has been established of printing the name of the candidate on the "blue list" under the grade which he has himself selected.

(4) As we read the Constitution all that is asked for in the first of the resolutions under which we were appointed may be accomplished under the Constitution as it now stands, namely: (a) The Board may classify candidates at any stage of proceeding and, in fact, does classify them sooner or later. (b) The Board has now ample power to direct that the "blue list" shall be issued as an unclassified list of candidates. This is a matter of procedure to be governed by considerations of expediency.

(5) But it is desirable and important that the applicants should know from the outset that the Board must eventually designate the class under which any candidate goes to ballot; and that the Board should always have clearly in mind its power and duty in this respect. Further,

It is necessary that the Board should collect information before classifying the candidate, and the most economical and efficient way to collect that information appears to be to send out the name of the candidate on a preliminary list, the present "blue list." But it is important and desirable that in this preliminary list the candidate should appear merely as a candidate for election into the Society, or for transfer, with no indication of the grade to which he aspires.

In sections 3 and 4 of this Report we have expressed the opinion that the Board has now, first, ample power to classify candidates; and, second, power to issue the "blue list" as an unclassified list. Yet, we are informed that the Board has interpreted the Constitution as restricting its power in the second particular.

(6) Therefore, in order to remove the idea that the "blue list" must be classified, at least so far as concerns the two grades of corporate membership, we recommend the following amendments to the Constitution:

Amend Art. III. of the Constitution, as follows:

Section 2, first line, after the words "Society as" strike out the words "Member or as Associate" and insert the words "a Corporate;" second line, after the word "to" strike out the words "either grade of." Section 2, Art. III., will then read, "An application for admission to the Society as a Corporate Member, or for transfer from any other grade to corporate membership, shall embody," the rest of the section standing as now.

Section 3, third line, after the word "membership" strike out the words "in any grade," and after the word "transfer" strike out the words "from one grade to another:" twelfth line, for the word "may" substitute the word "shall." The section will then read as follows:

"At stated periods, to be determined by the Board of Direction, there shall be issued to each member in any grade whose address is known, a list of all new applications received for membership or for transfer, which list shall be dated and shall contain a concise statement of the record of each applicant and the names of the references in the case of Corporate Member, and endorsers in the case of Associate, Junior or Fellow, with a request that members transmit to the Board any information in their possession which may affect the disposition of the applications. Not less than twenty days after the issue of such list, the Board of Direction shall consider these applications, together with any information in regard to the applicants that may have been received; may make further inquiries, if deemed expedient; shall classify the applicant with his consent, and on applications for Corporate Membership may direct a ballot."

(7) While this Report is designed especially to make clear the power and responsibility of the Board in the matters covered, we suggest further that much weight should be given by the Board to the information and opinion of those who write concerning the qualifications of the applicants. In the nature of things the condensed and meager record of experience can give but an imperfect measure of a man's character and ability; and it may easily be misleading.

The second resolution under which we are appointed directs us to report upon "raising the standard of qualifications for the several grades of membership." The qualifications described in Art. II. seem to be all that is judicious and expedient to set forth in the letter of the law. Their severity must remain largely a matter of interpretation by the Board of Direction. A member must be 30 years old; in the Institution of Civil Engineers (British) he must be 25. He must have had 10 years of practice; in the Institution he must have had five years. In the Society he must have had responsible charge of work for five years and must be qualified to design; in the Institution he shall be actually engaged in a responsible situation. In the grade of Associate Member the Society requires 25 years of age, six years of practice, and one year of responsible charge; the Institution requires that the candidate shall be 25 years of age and shall be actually engaged in design or construction. It is quite apparent that the specified qualifications are higher in the Society than in the Institution. It is also apparent that the phrases "responsible charge" and "qualified to design as well as to direct" are capable of a broad range of interpretation, but that they

could not be accurately defined in the Constitution. Further, the most important qualifications for membership are not matters of education or ability, but of character; and character could be specified in a written constitution only in general terms. It follows that, in the end, the standard of qualifications for membership must rest mainly in the judgment of the Board of Direction.

It has been suggested that hereafter no new member be elected directly to the grade of Member; but that every Member be required to pass first through a lower grade. It does not seem expedient to put such a restriction on the power of the Board of Direction. If the Board is charged with the specific duty of classifying candidates before they are passed to ballot we may well rest there, for, as has been pointed out above, the standard of qualifications comes back finally to the judgment of the Board.

We recommend no change in the qualifications for either grade as now prescribed in the Constitution.

This Report was signed by all the members of the Committee, namely; H. G. Prout, H. A. Carson, G. S. Williams, T. H. Johnson, E. J. Blake, D. Bontecou and J. D. Schuyler, representing the seven districts. Mr. Williams, however, made a postscript, inserting in the last paragraph after the word "grade" the words "of corporate membership," he believing that some modification should be made in the requirements for Associates and Juniors.

Early History of the Delaware, Lackawanna & Western Railroad and Its Locomotives.*

BY HERBERT T. WALKER.

INTRODUCTION.

The Delaware, Lackawanna & Western Railroad, in common with other trunk lines of the present day, is a consolidation of a number of short railroads which were originally separate corporations, and were acquired by the main line company by lease, purchase or otherwise at different times and under various conditions. Some of these roads were built and in operation many years before the main line (from Scranton to Great Bend) was constructed, so that in attempting to write the early history of the D., L. & W. R. R. system it is proposed to take up each one of the railroads separately, and in chronological order, as far as possible, by the dates on which they were organized for business, thus enabling the matter to be presented in a way that will show the growth of the system from the smallest beginnings, and also the development of the locomotives up to a time when they had attained a degree of perfection but little removed from engines of the present day, the chief difference being in dimensions and weight. Some of these locomotives were anthracite coal burners possessing features that are embodied in engines of that class to-day, and a record of their construction and performance can hardly fail to be of interest and value.

Before going into any details it may be well to look back and make a few general observations on the early days of practical railroading, when conditions were so widely different to what they are now that a glance backward will interest some of our younger railroad men. The writer is enabled to offer these remarks by having formed acquaintance with many of the officers and employees who were engaged in the administrative or construction work of the oldest divisions, and who have seen and handled the oldest locomotives of the D., L. & W. R. R. system.

It is remarkable that some of these men should be living to-day, and still more so that a few of them are yet in the company's service. The majority of them, however, are either engaged in other occupations or living in honorable retirement, not a few of them scarred and maimed by the accidents inseparable from the pioneer days of railroading, when derailments were frequent and explosions not uncommon. With strap or T rails, having very few ties, no fish-plates and no ballast; a 6-ft. track and sharp curves on mountain grades, and, moreover, with engines (as will be presently shown) having rigid wheel-bases and overhanging fire-boxes, it is obvious that life and property were not so safe then as they are at the present time.

Again, the engines, although they were as a rule well built, often had badly braced and imperfectly stayed boilers, and were occasionally subjected to pressures far beyond the limit of safety, because, to say nothing about reckless enginemen, it was impossible, in the absence of steam gages, to tell just how much pressure a boiler was carrying. The only way to form an opinion was to raise the lever of the safety valve by hand and judge by the sense of feeling; so that, repeating the words of a veteran who was a driver when engines had no cabs: "If the lever was easy to raise we had 100 lbs.; if it was not so easy we might have 75 lbs.; if it was hard to raise, we didn't know how much we had, nor did we know how much we had when she was blowing off." It has been reported that at least one firm of engine makers, in order to obtain the reputation of building "smart" engines, constructed their spring balances in a way so that when steam was blowing off the actual pressure in the boiler was above that to which the index was set. More than one explosion resulted from this reprehensible practice.

Whatever may be said about the hardships of modern railroad life, it is certain that in early times men having the care of engines and trains, from the superintendent downward, were mentally and physically taxed to the utmost to cope with the difficulties and dangers of their calling. It is true that engines and trains were lighter and fewer in numbers, but men were scarcer and worked longer hours. Engine-drivers received from $40 to $60 per month. Brakemen, firemen, wood-passers and oilmen were paid from $20 to $30 per month, no extra pay being allowed for overtime. All agree in saying that winters were longer and more severe than they are now; blinding snowstorms, deep snow drifts and intense cold were the usual thing. Even after engines had cabs they frequently rode tender first for lack of turntable facilities, and, as the cabs had no curtains, the enginemen sometimes came off a trip with their hair and beards frozen solid and themselves unable to speak, being almost dead with cold.

Freight trains were made up of small four-wheeled cars having inside journals, which could only be oiled by crawling under them between the wheels—a tedious and dangerous operation. There were no cabooses, the conductor riding on the engine and the brakemen hanging on wherever they could. Even after cabooses were introduced, brakemen were not allowed to ride in them. In inclement weather their experience can be readily imagined. As cattle were carried in open cars, the only way for a man to pass from one car to the other was to scramble over the backs of squealing pigs and restive oxen, and many a poor brakeman has escaped being frozen to death by taking shelter with the warm cattle. When the train stopped at a wood pile, the engine-driver sounded the whistle for "wood up," and the brakeman had a chance to exercise himself by helping to throw up six or eight cords of wood on to a high tender. While on the subject of wood, it is worth recording that with wood-burning engines of any size the fuel burned away rapidly and the fire-box had to be kept literally filled up to the fire door. This roaring mass of fierce flame was continually watched by the fireman, who, whenever a vacancy appeared dexterously pitched in a stick of wood (about 2 ft. long) to fill it up. There was generally an assistant fireman called the wood-passer, whose duty it was to carry the wood from the tender and pile it on the deck ready to the fireman's hand. The wood-passer was either the head brakeman or a young fellow who aspired to be an "engineer" some day, but unless he had courage and determination he did not stay long, for it was a rough place for a boy, removed as he was from the shelter of the cab, floundering in the splintery sticks of wood in a rocking, plunging tender and cursed by a surly fireman in case he failed to "set 'em up quick." Many of the old engine-drivers commenced life in the company's service as wood-passers, and take pleasure in recalling the day when they stood for the first time in that tender of the old Cooke or Rogers "beauty" that sent the showers of bright sparks flying over Clark's Summit in the early fifties.

There were few water tanks, and they were not properly protected from the cold. In many cases, water was taken from a spring on the hillside, but in either instance freezing up was a common occurrence, and the next train stopping there for water would be stalled and the passengers, instead of getting to their destination, would spend half the night in the train, some of them assisting the trainmen to thaw out the spring or carry water in buckets from a neighboring farmhouse.

In the absence of telegraphs, the superintendent was in profound ignorance of the position of trains, and, in case of accident or delay, trains were "lost" and no man knew of their whereabouts. The only thing to do was to send a man out on an engine (sometimes men went on horseback) to locate the train, and, as this was extra work, no one was particularly anxious for the job, especially in bad weather, when accidents generally occurred. It has been the experience of more than one engineman, after spending 15 or 16 hours on his swaying, plunging, truckless freight engine, who had gone home half dead with cold and fatigue and was in the act of getting into bed, when a knock at the street door, announcing a messenger from headquarters with word that Mr. Dotterer would like to see him "right away," compelled him to re-dress and wade through the snow to the superintendent's office, where he was informed that the passenger train from Great Bend was five hours late and not heard from, and it would be "a mighty good thing" if he could pull out and look for her. Then, as he steamed out of the Scranton yards on an inside connected ten-wheeler that was out of square and always had been, to face the freezing blast as it swept over the Tunkhannock Mountain, to say nothing of the risk of meeting the belated passenger train head on at some sharp curve, it is no wonder that he sometimes had thoughts of changing his occupation; and, indeed, the law of the survival of the fittest weeded out large numbers of these men, and only those of robust constitution, iron nerves and good courage endured to the end.

When an accident occurred, it was sometimes days before the wreckage could be cleared away because there was no wrecking crew, nor any of the special appliances now commonly used for such work. An overturned engine was a serious matter, and many a man has died under his engine, for the simple reason that it could not be moved in time to get him out alive. As doctors were few and hospitals non-existent, scores of trainmen died for sheer want of medical aid. Instances have been given that in cases of accident in the woods or sparsely settled country, an injured man has been laid on the grass by the track, and his comrades, unable to do anything for him, could only stand around and see him die. In the light of the present age of hospitals, doctors and "first aid to the injured" instruction, we can see that the old days were not altogether good, and that railroad men's lives are safer now and their chances of recovery far better than they were in the past.

It is to the credit of the D., L. & W. R. R. Co. that with all their accidents (there is no evidence to show they had any more, if as many, as their contemporaries) but very few passengers were killed or injured on their lines, either in the early or latter days of their history.

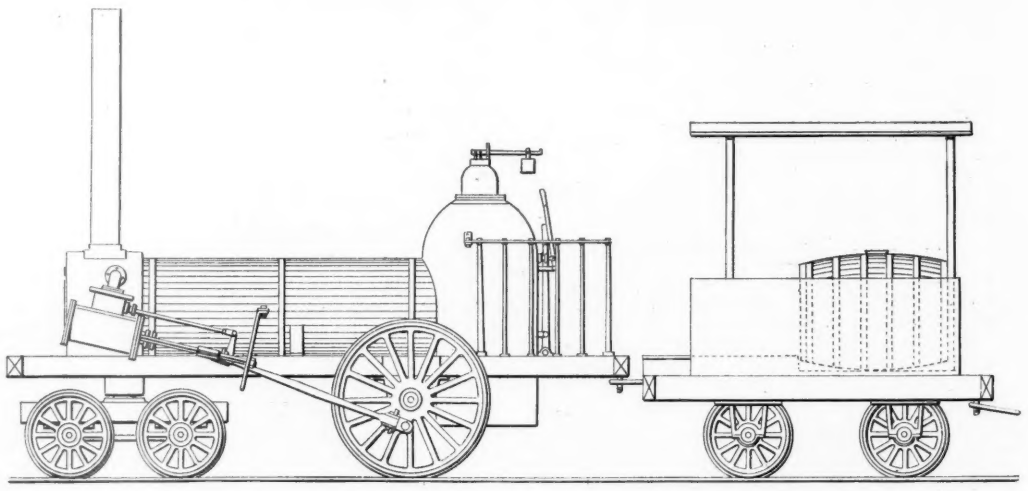

Fig. 1.—Ithaca & Owego Railroad—The Company's First and Only Locomotive, 1840.

In concluding these remarks it should be noted that notwithstanding the hardships, small pay, long hours and great dangers to which the men were exposed, there was a general good fellowship throughout the service, with a cheerfulness of disposition and a willingness to do the best for the company. If discipline was a little lax, the men were certainly more closely in touch and better acquainted with their officers than they are now, and as a result, discontent was rare and strikes unknown.

ITHACA & OWEGO RAILROAD.

The oldest portion of the D., L. & W. R. R. system was originally named the Ithaca & Owego Railroad, and is now known as the Ithaca branch. It was the second railroad incorporated in the State of New York, and a few original notes, for which the writer is indebted to Mr. John L. Mandeville, C.E., of Brookton, N. Y., who has lived in the vicinity of this railroad for over 50 years, will be of interest.

For some time before the company was organized the projectors urged that communication from the waters and country of the north and west with the Susquehanna River on the south by means of this railroad would "defy all competition" by any other route, it being the most direct, least expensive and shortest portage between the navigable waters of New York and Pennsylvania.

A capital stock of $150,000 was subscribed and the charter was dated Jan. 28, 1828. The first surveys were made in the summer of that year by the general Government, an appropriation having been made by Congress for the purpose at the solicitation of David Woodcock, the then Member of Congress from the district in which Ithaca and Owego were situated. However, no active measures were taken toward building the railroad until the construction of the Chemung Canal, from the head of Seneca Lake to Elmira threatened to divert trade from Ithaca and Owego.

About that time Simeon De Witt, Surveyor-General of New York State, who owned a large tract of land at the head of Cayuga Lake, and others interested in the prosperity of the towns at either end of the proposed railroad, became identified in the building of the line, and the work was prosecuted with vigor. In 1832 the north end of the road was completed and the capital stock was then increased to $300,000.

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A "Report to the Stockholders," signed by Francis A. Bloodgood, President, will be found in the "American Railroad Journal," year 1833, pages 562-595. It is a prolix document, more in the character of a prospectus than a report, and is too lengthy to be reproduced here. The Chief Engineer of this railroad was John Randle, Jr.

The length of the road was about 29 miles. Beginning at Ithaca it was necessary in order to ascend from the valley of Lake Cayuga, to construct two inclined planes, the first being 1,733½ ft. long, with a rise of one in 4.28 ft., and the second 2,225¾ ft. long, with an ascent of one in 21 ft. The whole elevation above the lake was 602 ft. in about eight miles, after which there was a descent of 376 ft. to Owego.

Stationary engine-power was used on the first, and horse-power on the second plane. Between Owego and the second inclined plane the cars were drawn by horses, the company having no locomotives. The track was standard gage, having a strap rail 2¼ ins. by ⅝ in. Trenches were made lengthwise about 1 ft. deep, filled with gravel and rammed, and upon this bed longitudinal sills 4 x 12 ins. were placed, which supported crossties 3 ft. apart. These crossties were gained to receive the stringers upon which the strap rails were laid.

The first 13 miles of the road were opened Feb. 13, 1834, and by April 1 of the same year it was completed. In the following May the capital stock was again increased, making a total of $450,000.

At the close of the year 1839 it was thought advisable to buy a locomotive engine, and Richard Varick De Witt, Treasurer of the railroad, who was something of a mechanic, prepared the general plans for one, and it was bound from Ithaca to a political meeting at Owego, arrived there with their train, but on foot and pushing the cars. As time was of some value, even in those days, the public began to clamor for an improved service, and the engine was sent back to the shop to be overhauled, but it was never successful, and after running about two years with more or less mishaps, it finally went through a bridge into the creek, between Catatonk and Candor, killing Engine-Driver Hatch and destroying the bridge.

As the business of this railroad was never anything like what was anticipated, the company decided to abandon locomotive traction, and "Old Puff," as the engine was called (it never had an official name), having been hauled out of the creek, was laid away in a shed, where we will leave it for the present and take up its subsequent history hereafter. The horse-car service—cheaper and faster than the locomotive, was then resumed, and Mr. Merrill secured a position as driver, and, with a team of nags and a sharp stick ran the horse-car "Express" until he was appointed engineman at a later period of the railroad's history.

Whilst these events were in progress the State had loaned the company a sum of money which brought its total indebtedness up to $300,000, taking a mortgage on the entire road and equipment. The financial revulsions of that period so prostrated business that the company failed to pay its interest. The State then foreclosed, and at a public sale of the Comptroller in Albany, on May 20, 1842, the Ithaca & Owego Railroad was sold to Henry Yates and Archibald McIntyre for the sum of $4,500, an additional sum of $13,500 being paid for the equipment, making a total of $18,000.

Simeon De Witt had died (Dec. 3, 1834) before this

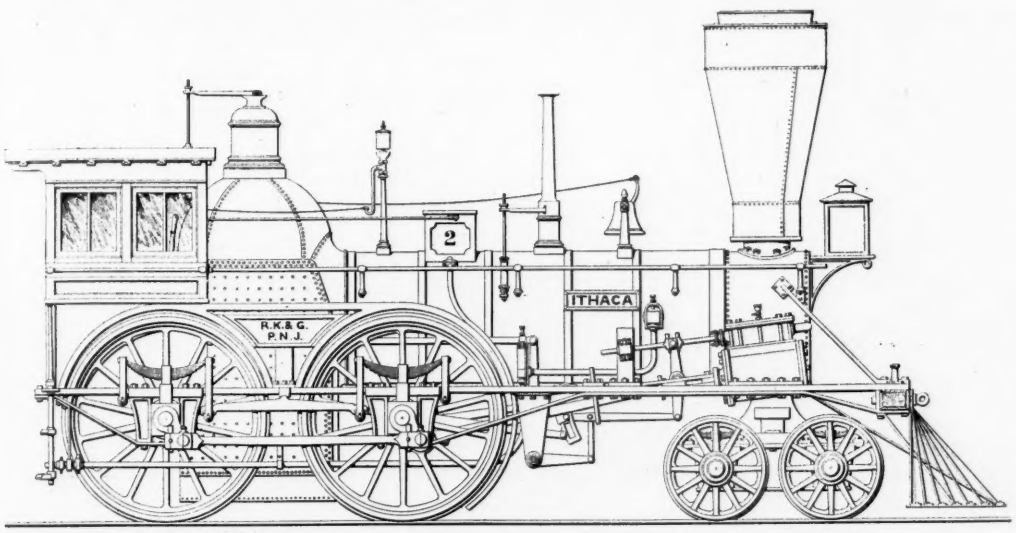


Fig. 2.—Cayuga & Susquehanna Railroad Passenger Engine, 1851.

built in the shops of Walter McQueen at Albany, and placed on the road in the spring of 1840. An outline of the engine is shown in Fig. 1. The leading dimensions were: Cylinders, 9 in. diameter by 16-in. stroke. The driving wheels had cast-iron hubs and wrought-iron spokes and tires with a diameter of 48 in. Diameter of boiler, 30 in.; height of stack from the rail, 12 ft.; length of engine over all, 17 ft.; weight, 7 tons. The frames were of wood 6 x 4 in., to which were bolted cast-iron pedestals for the driving wheels. It had hook motion of the Norris type. The steam pipes came out at the sides of the smoke-box, and were bolted to the valve-chest covers. It was found impossible to keep these joints tight, and the engine lost much steam from this cause; also from the safety valve, which had a weight instead of a spring. It seems almost incredible that in the year 1840 a locomotive was built with a weighted safety valve. It was, on the whole, a poorly designed and cheaply constructed engine. The tank was a cask mounted in a small tender, which also carried wood. The drawing shows only one tender, but the engine had two, because the one carrying the barrel was not large enough to hold sufficient fuel for a trip between terminals. Mr. James Merrill, who was originally employed on this railroad, and who was, until quite recently, engine despatcher at Scranton, was familiar with this engine. Former Master Mechanic Francis A. Brown also well remembers it. They state that the engine gave much trouble, being short of adhesive weight and a slow steamer. This defect, coupled with the loss of steam as above mentioned, rendered the engine almost useless in bad weather; in fact, it only ran in summer, horse cars taking its place in winter time, or when it was laid up for repairs, which was often. Its maximum load was eight four-wheeled cars, aggregating about 30 tons. Its day's work was to leave Ithaca at 7 a. m., arriving at Owego (27 miles) at 11 a. m. Returning, it left Owego at 5 p. m., arriving at Ithaca at 9 p. m. This speed gave passengers ample time to view the beautiful scenery of Tompkins and Tioga Counties. Mr. Merrill also affirms that he has seen a horse trader sit in the last car holding the halter of his horse, which trotted along on the track behind. Other eye-witnesses state that the engine gained such an evil reputation that good walkers declined to take passage in its cars because of their haste, and on one occasion a load of passengers reverse came, but the other public-spirited men who had hoped to benefit themselvs as well as the community were thus ruined.

The above-named Henry Yates and Archibald McIntyre then reorganized the road on April 13, 1843, under the name of the "Cayuga & Susquehanna Railroad Co.," and made every effort to increase the business, but with indifferent success, and the horse-car service was continued.

In 1846 Mr. W. R. Humphrey became a director and secretary, and under his management the road did as much business as could be expected, but it was not a financial success. The annual report for the year 1847 states that the expenses for construction, repairs, cost of running, etc., amounted to $30,765.84, the income from passenger traffic being $3,581.05, and from freight traffic $17,644.23, making a total income of $21,225.28. The report furthermore says that the company had one engine (not in use), 5 passenger cars, 55 freight cars, 40 horses and 32 men.

Mr. Humphrey was a most respected citizen of Ithaca, where he resided for the rest of his life. In the course of an agreeable interview he stated that in 1848 it was decided to place the Cayuga & Susquehanna R. R. in the market, and a power of attorney was given him by Messrs. Yates and McIntyre with that end in view. Without going into unnecessary details, it will suffice to say that Mr. Humphrey had more or less to do with closing a deal with William E. Dodge, Colonel G. W. Scranton and the associate owners of the Leggett's Gap Railroad Charter, and the C. & S. R. R. was transferred to the new owners in June, 1849.

It was decided by them to employ locomotives and to rebuild and re-equip the road throughout, Colonel Scranton being chosen as President and to have general charge of the reconstruction.

As the Leggett's Gap Railroad was the original name of the D., L. & W. R. R., it will be dealt with in taking up the history of the main line between Scranton and Great Bend, it being only necessary to say here that Colonel Scranton was a man of extraordinary energy and enterprise, with the faculty of making a success of every project he was identified with. One of the main objects in purchasing the C. & S. R. R. was to reach and make a more northern market for the product of the anthracite coal fields and iron industries which Colonel Scranton and his associates were interested in, and which they knew must be the chief source of revenue of the Leggett's Gap Railroad. With this matter in view they undertook to have the road in working order by Christmas of the same year (1849), a feat that was pronounced impossible by many, for the ties had to be cut and the iron forged with coal that was still in the mine. But all these hindrances were overcome, and the forest was soon ringing with the strokes of the woodman's axe, and the iron was forged and rolled at the mills of which Colonel Scranton was part owner. The old strap rails were removed and the track relaid with "heavy T rails." At Owego the line was extended to connect with the Erie Railroad, and the track made a 6-ft. gage to conform thereto. At Ithaca the terminus was changed to avoid the old inclined planes at that point. These improvements cost about $400,000, and were pushed with so much vigor—an engine named "Orange" being borrowed from the Erie Railroad Co. for construction work—relays of hands and laying the rails by moonlight that the road was ready for traffic before the promised time.

In the meanwhile, it had been decided to order the locomotives from Rogers, Ketchum & Grosvenor, of Paterson, N. J., and Colonel Scranton had several interviews with Thomas Rogers, the leading partner in that famous firm of engine builders. By the courtesy of the late Mr. R. S. Hughes,* former President of the Rogers Locomotive & Machine Co., the writer had the privilege of examining the company's books, records and drawings, a laborious but most interesting task, many of the entries and sketches having been made by Mr. Rogers' own hand, the ink being so pale as to be scarcely legible.

The order book shows that under date of June 29, 1849, the C. & S. R. R. ordered two eight-wheeled inside-connected locomotives, to have copper flues, cut-off to the cylinders and to weigh about 20 tons. Also two eight-wheeled engines, to have cowcatchers and "a house over the footboard." Six-foot track. If a patent spark arrester was required the railroad company would be charged the patent fee. It may be noted that Rogers had his own spark arrester—a very good one and not patented—for which he made no extra charge.

The Rogers delivery book states that on Dec. 5, 1849, engine "W. R. Humphrey" was delivered. Cylinders 15 in. diameter by 20-in. stroke, four 6-ft. driving wheels; weight, 23½ tons; shop number, 196; price, $7,600. On Dec. 15, engine "G. W. Scranton" was delivered. Cylinders, 16 in. diameter by 20-in. stroke; four 5-ft. driving wheels; weight, 26 tons; shop number, 197; price, $7,800. On April 22, 1850, engine "Simeon De Witt" was delivered. Shop number 211, same dimensions and price as the "G. W. Scranton."

At Mr. Humphrey's request the inscription plate of the engine named after him was changed to "Lackawanna."

On the completion of the road, a meeting of the directors was held and Mr. Humphrey was elected superintendent. At about that time he purchased two old passenger cars from John Wilson, President of the Oswego & Syracuse Railroad, in order to meet the expected increase of business.

The first train on the newly constructed road was run Dec. 17, 1849, starting from Ithaca, and Mr. Mandeville, who was present on that day, well remembers it. The occasion was one of considerable rejoicing, and passengers were allowed to ride free of charge. The engine was the "G. W. Scranton," and before starting the train it was found there was not enough wood in the tender to take the train to Owego, so the bystanders helped to saw up some of the old track ties, and soon the tender was filled to overflowing. All enjoyed themselves that day and felt certain that an era of prosperity had begun for and by the reorganized railroad.

Returning to the Rogers order book we find, under date of Feb. 8, 1851, a request from Mr. Dodge ordering the fourth engine (not yet delivered), to be named "Ithaca." This was done, and the engine sent off on the 19th of the same month. Shop number, 250; price, $7,919. The engine is illustrated in Fig. 2, and the principal dimensions were: Cylinders, 15 in. diameter by 20-in. stroke. Driving wheels, 6 ft. diameter. The weight was about 23 tons. Mr. Sidney Broadbent, of Scranton, who was foreman of the D., L. & W. R. R. repair shops in 1855, states that the heating surface was only 667.98 sq. ft. It will be noticed that the frames were outside the wheels and the pedestals were of cast-iron. The engine was inside connected with half cranks; that is, the crank-pin was secured on one side to a boss on the driving wheel, and on the other to a crank on the crank axle, so that the wheel itself formed one arm of the crank. This device was patented by Baldwin in 1834, and is illustrated in the "History of the Baldwin Locomotive Works," page 14. The coupling rods had solid ends. The valve stem was moved by the upper rocker arm playing in a yoke having brasses with keys and set screws, the same as on many engines to-day, the stem being extended rearwardly and guided in a box bolted to the boiler bracket. The link motion was the "suspended" design, which was originally introduced by Sir Daniel Gooch, Master Mechanic of the Great Western Railway (England), in 1843. It never gave satisfaction in this engine, as the valve did not cut off equally at both ends of the stroke. The stack was of the French & Baird design, the original patent of which is dated June 16, 1841. The prominent feature of this invention was an inverted cone fitted with volute flanges, which gave a

*Mr. Hughes died at Paterson, August, 1900.

rotary motion to the sparks. Around the cone was a casing having side apertures, through which the sparks were discharged into the space between the inside and outside stacks. The top of the stack was provided with a series of V-shaped circles, perforated with numerous holes, thus presenting a large area through which the smoke escaped.

The boiler had a Russia iron jacket, with bands of polished brass, but there was no jacket on the fire-box, which was of the "Bury" type. These fire-boxes were rubbed over with a mixture of tallow and beeswax, which protected the iron from the weather. The bell, steam dome and safety-valve column were all of polished brass, as was also the hand rail, wheel guards and name plates, giving the engine a showy appearance.

This engine was erected in the Rogers Works under the supervision of John Cooke, who was then the superintendent. He was accounted one of the best superintendents Rogers ever had, retaining that position until 1852, when he retired and became one of the founders of the firm of Danforth, Cooke & Co., to whom we shall have occasion to refer later on.

The "Ithaca" did not work long on the C. & S. R. R., for when the Lackawanna & Western Railroad was opened from Scranton to Great Bend in 1851 the coal traffic of the C. & S. R. R. began to increase, as Colonel Scranton intended it should, and it became necessary to get a freight engine to haul the heavier loads. It was therefore decided to obtain a "heavy" 10-wheeler from the Lackawanna & Western Railroad, and send them the "Ithaca" in exchange. This was done toward the latter part of 1851, and the final history of the "Ithaca" will be given in its proper place, but the freight engine can be described here. It was an inside connected, half-crank, six-coupled engine, with a leading truck and weighed about 65,000 lbs. The cylinders were 18 in. diameter by 20-in. stroke, and driving wheels 60 in. diameter; total heating surface, 1,252 sq. ft. This engine was named "Tunkhannock," and was built by Rogers, Ketchum & Grosvenor. On one occasion it hauled 100 cars, containing 502 tons of anthracite coal, from Owego to Ithaca 35 miles, at 9 miles an hour "without a single accident or slipping of wheels upon the whole trip." Ten miles of the distance were on an ascending grade of 21 ft. to the mile, and 2,000 ft. on a rising grade of 30 ft. to the mile.

The annual report of the C. & S. R. R. for the year 1851 states that the company had an enginehouse and shop, and four locomotives. The average speed of passenger trains, including stops, was 23 miles an hour, with a maximum speed of 27 miles an hour. The average freight speed was 8 miles an hour, including stops, the maximum being 10 miles an hour. Average weight of passenger trains, 60 tons, and of freight trains, 113 tons.

Somewhere about the latter part of 1850, the engine "Old Puff," which had been ignominiously retired, was pulled out of the shed and sent to the Lackawanna & Western Railroad, to do its best (or worst) as a construction engine, and the end of its career will be described in due course.

We shall now have to take leave of the C. & S. R. R., for on April 21, 1855, it was leased in perpetuity to the Lackawanna & Western Railroad (which had then become the D., L. & W. R. R.) at an annual rental of $54,600. It was then called the Cayuga division, but has lately been known as the Ithaca branch. Mr. Humphrey continued to be superintendent and coal agent to within a short time before his death, which took place in July, 1901.

(To be Continued.)

The Stresses in Underframing.*

There is very little knowledge of the actual stresses to which the draft gears of freight cars are subjected in daily service, and realizing this the committee, shortly after its appointment, made arrangements to obtain data in regular freight service. The Westinghouse Air-Brake Co. had just completed a dynamometer car especially designed for this work, and loaned the car to us. The tests were conducted on the Lake Shore & Michigan Southern, and altogether 34 trips, aggregating 2,512 miles, were made with the car on that road. The chief object of the tests was to throw some light on the magnitude of the stresses that may be expected in ordinary service, but in addition to this a few trips were made with solid trains of steel cars loaded with coal and equipped with twin-spring draft gears, and the same number of trips were also made with cars of the same construction equipped with friction draft gears.

It is difficult to make comparisons between two kinds of draft gears on the data obtained from a few trips only, but yard tests made upon the same trains demonstrated the value of the increased resistance obtained with the friction gear. The trains equipped with spring gears were broken in two repeatedly under conditions that resulted in no damage whatever to the cars equipped with the friction gear.

We present in table No. 1 the more valuable part of the information obtained during these tests. In the more than 2,500 miles run by the car, of course many records were obtained, but they are too voluminous to produce in their entirety. The nominal capacity of the apparatus was 300,000 lbs., but it will be noted that on two occasions this was greatly exceeded. The engines used in the tests were of the consolidation type, weighing 155,000 lbs. on drivers, and having a total weight of 175,000 lbs. The cylinders were 21 x 30 in. and the steam pressure 200 lbs. The tractive power of the engines was about 36,000 lbs. Some of the tests were made on the main line, where the grades do not exceed three-tenths of 1 per cent., and others were made between Ashtabula and Youngstown, where the maximum grades are about 1 per cent.

One of the notable facts in connection with the tensile stresses is their low average. The strongest shocks or stresses in this direction seldom exceeded 50,000 lbs. It was found early in the tests that out on the road with a skillful engineer on the engine the tensile and buffing stresses seldom exceeded 50,000 and 80,000 lbs. respectively. With a less skillful engineer, however, the stresses increased to about 70,000 and 150,000 lbs. respectively. These are stresses arising through the manipulation of the engine and train, the train remaining intact; that is, no cutting of the train to set out or take on cars, etc. These figures are much smaller than was expected and admit of several explanations. In the first place, the maximum stresses are not to be found in any one place in the train, and therefore the dynamometer cannot be placed where it will always give the maximum records. This is well illustrated in test No. 54, in which the train broke in two, and yet the greatest tensile stress recorded during the trip was 50,266 lbs., and this did not occur at the moment of breaking in two. It follows that only a large number of records will give us a true idea of the actual punishment draft gears will stand. In the second place these tests were carried out on a road handling a miscellaneous equipment in long trains, and the enginemen and all others interested in the movement have learned that even moderately rough handling results disastrously. To show what may be expected under other conditions, we give in table No. 2 some results obtained with the same car on another road and with equipment fitted with friction gear. Here the men handled the trains roughly, for the simple reason that everyone had learned that care was not necessary. It will be seen that the stresses are very much higher than in table No. 1, and if the same forces had been applied to spring gear equipment the dynamometer records would have undoubtedly shown larger stresses than are to be found in table No. 2, because of the smaller cushioning effect of the spring gears.

There is one fact standing out prominently in the results of the tests given in table No. 1, which is that the most ordinary movement in coupling up engines and cars, even if performed with care, results in heavy buffing shocks. An engine coupling on to its train gives stresses ranging from 65,000 to over 142,000 lbs.; a switch engine coupling onto the dynamometer car standing alone gives a stress of 103,673 lbs.; when a string of loads was behind the car the switch engine coupling on gave a buffing shock of 199,482 lbs.; and 30 loaded cars moving at about six and one-half miles per hour and coupling on to 10 loads with brakes set gave a shock of 376,492 lbs. Upon arrival at West Seneca, after the completion of a certain trip, the train was placed on the receiving track in the poling yard, and the dynamometer car being on the head end, the first operation was to pole it onto a track that was supposed to be clear. There was, however, a loaded 60,000-lb. furniture car standing on the track, and

*Report of a Committee at the May meeting of the Western Railway Club. Presented by Mr. W. H. Marshall, Chairman.

TABLE NO. 1.—LAKE SHORE & MICHIGAN SOUTHERN TESTS.

Test No.	Heaviest buffing force.	Conditions producing the same.	No. of empty cars in train.	No. of loaded cars in train.	Total No. of cars.	Weight of train in tons.	Position of dynamometer car in train.	Friction draft gears.	Spring draft gears.
52	381,704	Dynamometer car kicked into loaded furniture car at a speed of 13½ m. p. h. Recoil of 72,257 lbs.	....	....	....	.....	.....	....	....
66	376,992	Engine, dynamometer and 4 loads—449 tons—coupling on 22 loads at 5.44 m. p. h.	0	26	27	1836	Next to Engine.	0	26
49	117,810	Engine coupled to train.	2	47	50	2383	Next to Engine.	0	49
40	65,964	Engine coupled to train.	21	28	50	1494	Next to Engine.	0	49
67	152,368	Slacking back at water tank.	0	26	27	1849	Next to Engine.	0	26

TABLE NO. 2.—LAKE SHORE & MICHIGAN SOUTHERN TESTS.

Test No.	Heaviest jerk.	Conditions producing the same.	No. of loaded cars in train.	No. of empty cars in train.	Total No. of cars in train.	Weight of train in tons.	Position of dynamometer car in train.	Friction draft gears.	Spring draft gears.
64	71,471	Slack bunched hard, engine started with full power.	40	0	41	2224	21st car.	40	0
36	69,115	Jerk in taking up slack on start out of West Seneca.	23	27	51	1453	32nd car.	0	50
55	34,858	Tractive effort during hard pull over summit of Tyrell Hill.	....	....	45	1550	Next to Engine.	0	45
43	45,982	Slack ran out on release after brake application	54	1	56	1814	Next to Engine.	0	55
58	23,562	Maximum tractive effort during start.	24	0	25	1279	10th car.	0	24

TABLE NO. 3.—BESSEMER & LAKE ERIE TESTS.

Test No.	Heaviest buffing force.	Conditions producing the same.	No. of loaded cars in train.	No. of empty cars in train.	Total No. of cars in train.	Weight of train in tons.	Position of dynamometer car in train.	Friction draft gears.	Spring draft gears.
7	216,770	Engine and 18 loads pushed into dynamometer car and 15 loads at 3 m. p. h.	33	1	35	2331	19th car.	34	0
20	106,800	Engine backed into train.	34	2	37	2267	Next to Engine.	35	1
5	43,928	Coupling engine to train.	33	1	35	.....	Next to Engine.	34	0
26	56,550	Brakes applied with 10 lbs. reduction, followed by 25 lbs. reduction.	....	....	....	.....	12th car.	....	....
17	76,969	Coupling engine to dynamometer car.	33	2	36	2326	16th car.	34	1

TABLE NO. 4.—BESSEMER & LAKE ERIE TESTS.

Test No.	Heaviest jerk.	Conditions producing the same.	No. of loaded cars in train.	No. of empty cars in train.	Total No. of cars in train.	Weight of train in tons.	Position of dynamometer car in train.	Friction draft gears.	Spring draft gears.
5	64,402	Steady pull of 2 engines.	33	1	35	.....	Next to Engine.	34	0
33	31,416	Recoil from buff of 120,952 lbs.	4	38	43	1858	25th car.	26	16
26	83,552	Knuckle broke back of 6th car on this jerk.	....	....	....	.....	12th car.	....	....
32	80,112	Pulling through yard. Both engines wide open and on sand.	39	2	42	2738	Next to Engine.	40	1
8	67,554	Jerk to start train.	39	3	43	2513	Next to Engine.	41	1

the dynamometer car struck it at a speed of 13½ miles per hour. The apparatus in the car recorded 381,704 lbs., which was its limit. What the actual shock was cannot be told. A coupler was broken and some slight additional damage was done. The car was new, which doubtless explains the small damage done.

From the general results of the tests covered by tables 1 and 2 it is believed that the tensile stresses in draft gears with careful handling will frequently reach 50,000 lbs., with ordinary handling 80,000 lbs., and with decidedly rough handling fully 100,000 lbs., while the buffing stresses can be placed at 100,000, 150,000 and from 200,000 to 300,000 lbs. respectively. In extreme cases the buffing stresses will go considerably above the last named figure. It will undoubtedly require more extensive tests to determine whether these figures need modification, but it is evident that the tests give us a more definite idea of the stresses which draft gears and sills must stand than we have been able to obtain heretofore. Continued investigation along these lines should finally result in a sufficient amount of information to permit of a more exact method in the designing of draft gears.

We think the figures show the necessity of something better and more effective than the spring draft gear so commonly used. It would be reasonable, in view of the above figures, to require draft gears and underframes to be capable of withstanding tensile stresses of 150,000 lbs., and buffing stresses of 500,000 lbs., and it is evident that the present spring resistance is inadequate. Whatever one may think of the details of the various friction draft gears, it must be evident that in the character and amount of resistance they are superior to the spring gears.

Some figures have been published from time to time showing the cost of repairs to draft gears. With a view of showing not only how much it cost to maintain the draft rigging, but also the end sills, center sills, and all other longitudinal sills of wooden cars, and to what extent a railroad would be justified in increasing the first cost of such parts, to save money in maintenance, an attempt was made to collect these figures from the accounts of a certain road. This was done by taking the cost of the repairs to such parts on the company's cars while on its own road and adding to those figures the cost of repairs to these parts as billed against the company by foreign roads; but as these bills included only the repairs for which the owner is responsible, and not the more extensive damages for which the user is responsible, the figures are of no value, particularly as the cars of the road keeping these figures made a large mileage on other lines. If, however, such costs could be obtained with accuracy they would not only throw some light on the question of draft gears, but might also indicate to what extent we are justified in increasing the first cost of cars through the use of steel center sills, steel sub-sills for the draft rigging, or steel underframes.

When the committee began its work it was expected that it would be able to present some figures on costs that would show if some construction other than the wooden underframes on the one hand and the expensive steel underframes on the other would not be justified, such, for instance, as the use of steel center sills or steel sub-sills under wooden sills, as it is evident that the greatest damage to the present wooden underframing occurs from the shocks transmitted through the draft rigging. While disappointed in not being able to go very deeply into this portion of the subject, it is thought the information obtained from the road tests mentioned was of sufficient value to warrant its presentation without further delay.

DISCUSSION.

This report was received too late to be sent out to the members and copies were distributed at the meeting. The time for consideration of the report having been so short, the discussion was correspondingly brief. Some extracts follow:

Mr. J. A. Carney (Chicago, Burlington & Quincy): It seems to me that this question of draft rigging as a whole is dependent on the entire underframing of the car. A case has been brought to my notice quite recently where we put on a very improved method of double-spring draft rigging which was strong enough to stand ordinary shocks. We found that the whole draft rigging pulled away from the sill, breaking the sills in two. Whatever additional strength we may give to our couplers or draft rigging, we have got to put an equal amount of strength into the body of the car.

Mr. E. M. Herr (Westinghouse Air-Brake Co.): I had the pleasure of riding on the dynamometer car in some of the tests recorded in the committee's report, and can say that I was also surprised, as several of the members have expressed themselves, at the magnitude of the shocks and blows that were delivered in ordinary train operations. As explained in this report, the maximum strains are very difficult to get in the dynamometer car, as of course it can occupy only one point in the train, which may not at all be the point of maximum stress. As a matter of fact, the maximum tensile stress recorded in all the dynamometer tests, but which is not shown on the report, was close to 109,000 lbs., if I remember right, but the buffing stresses ran frequently over 300,000 lbs., not, however, in normal train operations.

The manner of handling the equipment when friction gears are applied has been spoken of as being more severe. This is probably true, but the results show that despite more severe handling there is less damage to equipment. The instances in which trains were handled on the two roads, one with friction gear and one with spring gear, indicated that it was entirely possible to handle the equipment with friction gears in a way spring gears would not admit of. It has enabled engineers to take runs on hills through sags with the assurance that they would not break in two, while, of course, with other gear the damage would have been very great.

President W. F. M. Goss: I would like to ask Mr. Herr whether in reducing these maximum buffing stresses the pen on the dynamometer car would go up and stay up, or whether it was merely an instantaneous movement of the pen? Was the heavy force, when recorded, sustained, when running into the higher figures?

Mr. Herr: Generally it was not; the heaviest blows were never sustained; they were in the nature of a sudden blow, just as you feel it when you are on the car; it comes with a great suddenness and is over, and the record showed that generally, with several lower indications, the blows below 100,000 lbs. were frequently sustained, but above 100,000 I do not think ever entirely sustained and very rarely sustained at all; it nearly always occurred as a blow and was immediately relieved.

The President: Under those circumstances, Mr. Herr, is it judged that the dynamometer record is a correct record, or is it merely indicative?

Mr. Herr: That I can hardly answer. It seems to me that the dynamometer record, if anything, is always the actual stress. Of course there is a certain amount of inertia in the mechanism of the dynamometer which would tend to reduce the effect upon the liquid that is used as a medium.

[The tabulated data of these tests which accompanied this report are of but moderate interest aside from the characteristic records in some particular cases. We append four tables, compiled from those presented by the Committee which give some of the most characteristic records in both tension and buffing on the Lake Shore & Michigan Southern and the Bessemer & Lake Erie. No convincing comparison can be made between the two types of draft gears from the data obtained.

The dynamometer car of the Westinghouse Air-Brake Co., referred to by the Committee as used in making the tests, has a nominal capacity of 300,000 lbs. with an actual capacity as shown in one record of more than 380,000 lbs. Figs. 1 and 2 show a side elevation and end section of the hydraulic pressure cylinders and their attachment to the coupler and the car. As first designed a friction draft gear was inserted between the followers DD, but in these tests this was replaced by a solid casting. The heavy steel casting C replaces the usual draft timbers and follower stops, and transmits the stress through the trunnions HH, to the levers BB. These fulcrum about II, two heavy pins secured to the sub-base K. A casting G is bolted between these two levers and carries the knife edges which bear against the hardened plates set in the movable pressure head A, which is made in one piece. The trunnion bearings are four point roller bearings designed to eliminate friction and to keep the points of contact always in the same relative positions.

The base plate J, is bolted and keyed to the heavy steel plate which extends the width of the car and is securely riveted to all the frames. The sub-base K is keyed to J and the cylinder casting F is in turn bolted to it. This gives a very rigid fastening and admits of no looseness, destructive to accurate measurements.

When any pressure is applied at the coupler it is transmitted through the followers to the casting C, and to the levers BB. These move either forward or backward as the pressure is compression or tension and exert pressure on the head A. This is transmitted through ½ in. pipe, tapped into the cylinder at EE, to the indicators, similar to the ordinary steam engine indicator. There are two of these mounted on either edge of the roll of paper, one connected to the forward cylinder for registering compression and the other to the rear cylinder, registering tension. The paper is moved under the pencils by clockwork, independent of the movement of the car. An electrical make and break on the car axle records the revolutions on the paper and seconds are recorded by a chronograph. To make the apparatus sensitive, both indicators were kept under a pressure indicating 8,000 lbs. for which a correction was made in the datum lines. The apparatus was calibrated by means of carefully calibrated springs before the tests and a number of times during the tests without any appreciable variation.

The car has pressed steel underframing and was designed to withstand very heavy shocks. We are indebted to Mr. E. M. Herr, General Manager of the Westinghouse Air-Brake Co., for the drawings and description of the dynamometer car.]

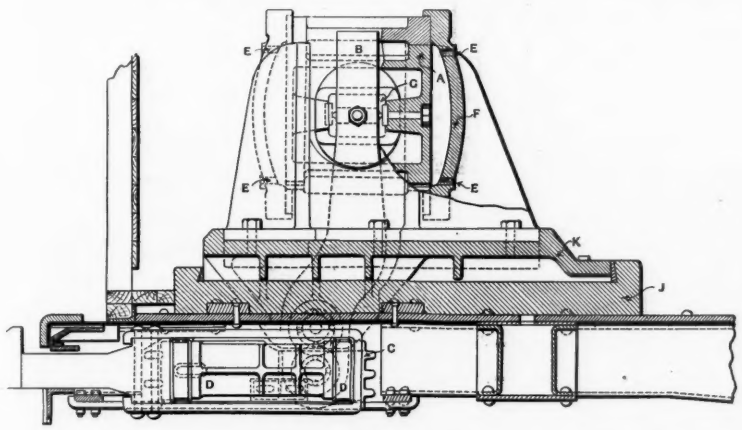


Fig. 1.

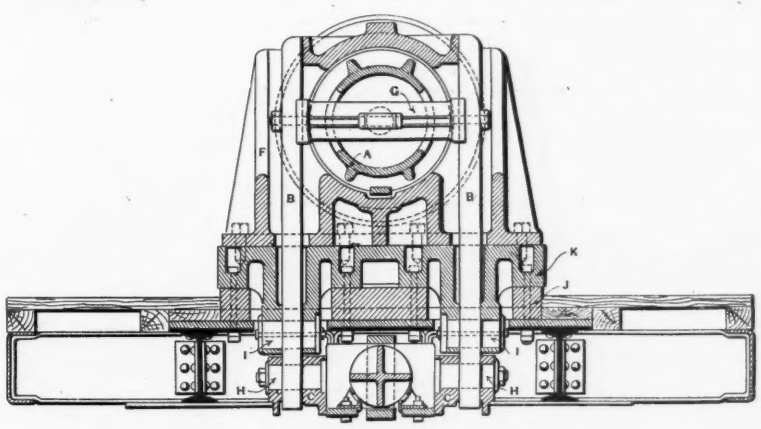


Fig. 2.

Suburban Annex, Chicago & North Western Station.

A depot for suburban service, to be built as an annex to its present Wells Street Station in Chicago, has been begun by the Chicago & North Western. The present terminal facilities have for some time been inadequate to handle the volume of passenger business and the improvement now being made is expected to relieve the pressure somewhat. The plans for the building, prepared by Frost & Granger, Chicago, show a two-story and basement structure, following the architecture of the present station building. It will be red brick with stone trimmings and slate roof. The location is south of the present station, between the latter and the Chicago River, with a frontage on Wells street of 156 ft. 6 in. and a width of 58 ft. 2 in.

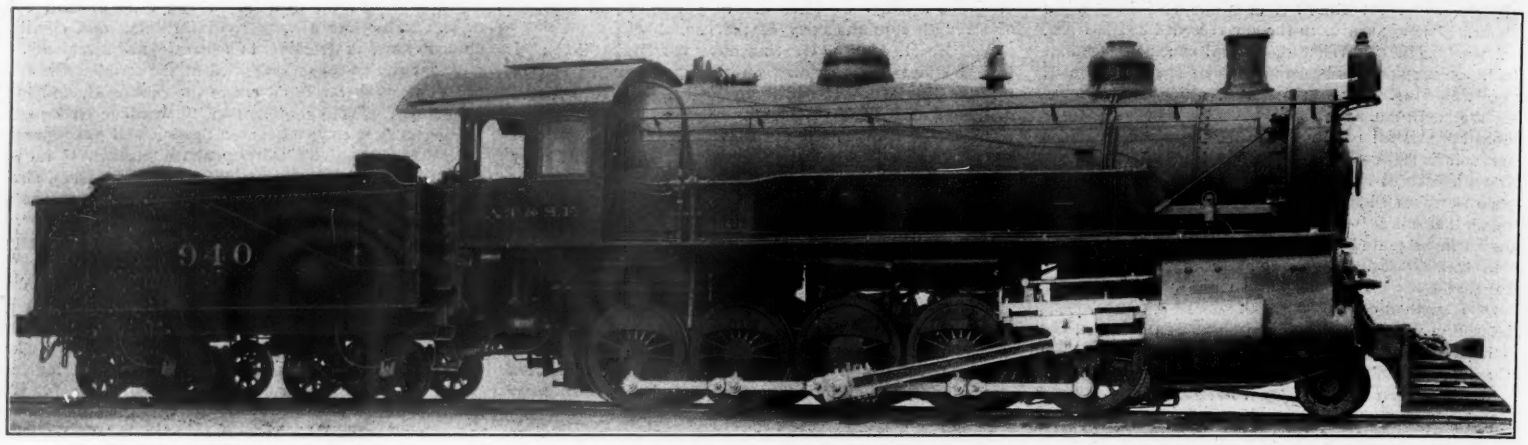
The foundations have a footing course of concrete laid over with block rubble. The suburban waiting room floor is carried by a double row of cast-iron columns, spaced 18 ft. centers and supporting I-beams running both longitudinally and transversely, the former 15 in. deep and the latter 8 in. The basement floor, which is at the track level, is laid with brick on concrete. This floor will be used for baggage rooms and trainmen's quarters.

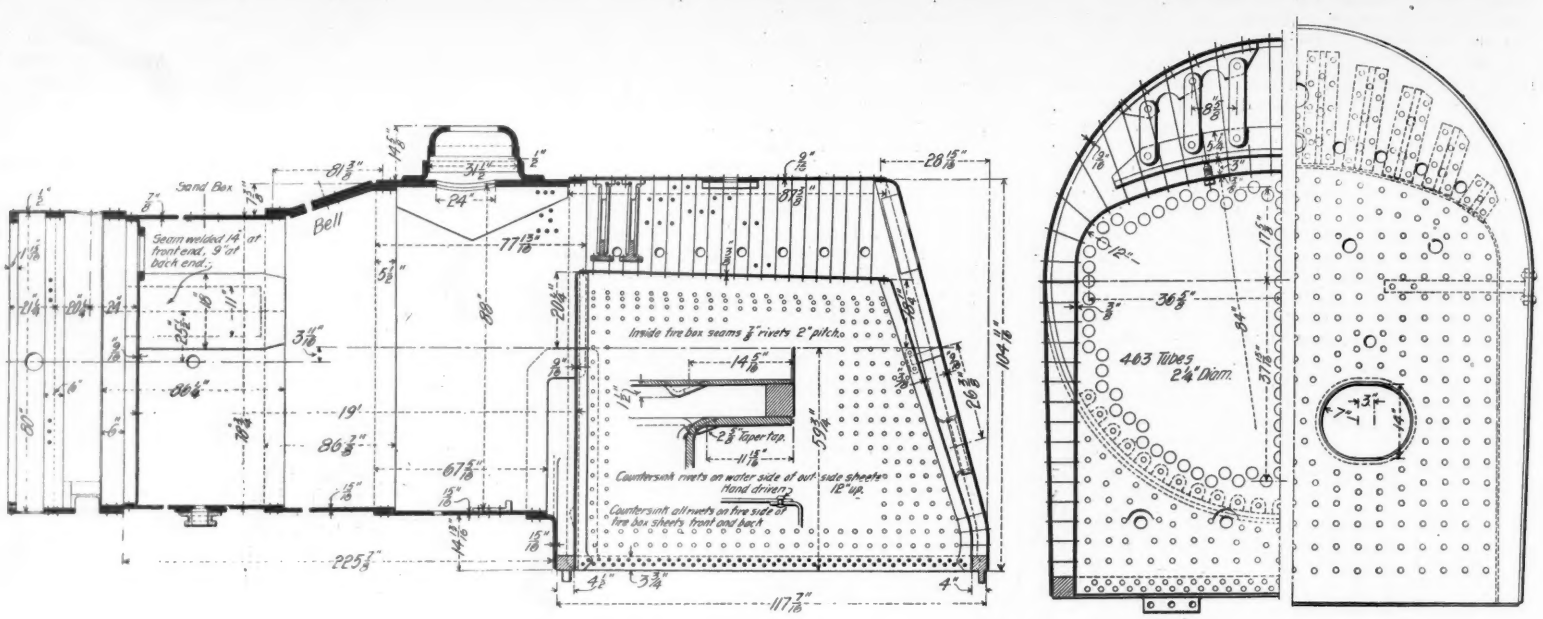
The suburban waiting room will be 54 x 153 ft., having a main entrance from Wells street, 30 ft. 6 in. wide, opening into a broad vestibule, separated from the main room by swinging doors, between ornamental metal mullions. This room is to be finished into the roof and has a clear height of 24 ft. under the trusses, which are timber with round-iron ties, and an additional height of 26 ft. to the crest of the roof. Under the extremities of each truss and extending down some 8 ft. are to be carved wooden cornices. The room has a wooden floor and the finish is plaster, above a wooden wainscoting, the plaster extending to the crest of the roof. Provision will be made for suburban ticket offices, and news and cab stands, in addition to the accommodations for passengers.

Connection to the main station is made from this floor through a vestibule 61 ft. 10 in. long and 21 ft. wide. It is carried by box girders resting on latticed columns, has glass sides and a concrete floor. The suburban tracks, which are at the west side of the building, are reached from the waiting room by four staircases, each 18 ft. wide; as there are eight tracks, this gives a stairway for each pair of tracks. Umbrella sheds will afford protection to passengers against rain.

The main station has nine tracks, all of which are required for through passenger service. With the eight which will be provided for suburban business there will be a total of 17 in the terminal. About 260 trains are handled at this terminal daily, some 200 of which are for suburban traffic.

A large transfer freight house of the New York Central at East Buffalo was destroyed by fire on the morning of May 23, together with 300 loaded cars.





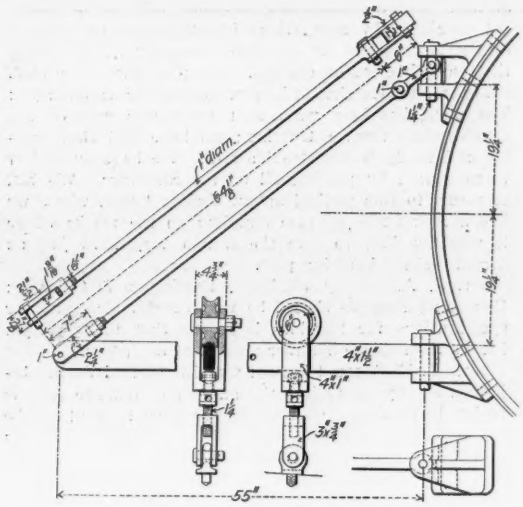
Tandem Compound Decapod for the Atchison, Topeka & Santa Fe.

Mr. G. R. Henderson, Superintendent of Motive Power. *Built by the* Baldwin Locomotive Works, *Philadelphia*

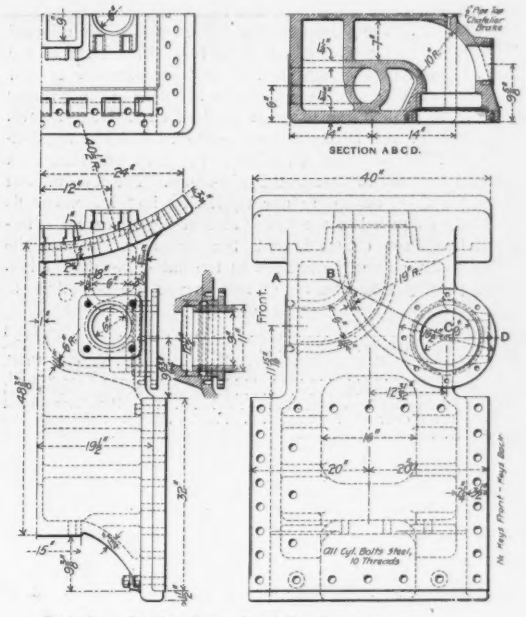
Tandem Compound for the Atchison, Topeka & Santa Fe.

The Baldwin tandem-compound decapod recently built for the Atchison has the distinction of being the heaviest locomotive engine in the world. It weighs 267,800 lbs., all but 30,000 lbs. being on the drivers, which gives an axle load of 47,560 lbs. Its nearest neighbor in point of weight was built at Schenectady for the same road, but was some 8,000 lbs. lighter. The tractive power of this engine is something over 62,000 lbs. The Baldwin engine surpasses all competition in the matter of heating surface, having a total of 5,390 sq. ft. This is 709 sq. ft. more than that of the engine just referred to. The grate area is 58½ sq. ft. When one considers the rate at which fuel is burned in locomotives for the purpose of generating steam, the words of Prof. Goss in his book on "Locomotive Sparks" are very suggestive. He says: "Nowhere are fires urged with greater intensity except in forges or in furnaces employed for metallurgical purposes. It may be said that the grate of a modern locomotive has an area equal to that of a large sized dining room table." To get, perhaps, a better idea of what these heating surface figures mean, it may be stated that this compound decapod has about one-eighth of an acre of heating surface. A tennis court when laid out full size on a level lawn measures 36 ft. wide by 78 ft. long, and encloses 2,808 sq. ft. The heating surface of this engine would make something under two good tennis courts.

A detail which at once arrests the attention of the observer is a couple of small cranes, permanently attached, one on each side of the smoke-box. This attachment is the first of the kind which has been applied to any locomotive by the Baldwin people. It is for the purpose of removing the high-pressure cylinder, in order to facilitate the inspection of the high-pressure piston, and the rod packing between the cylinders. To take down the high-pressure cylinder the threaded eye-bolt of the crane is screwed into a tapped hole in the top of the valve chamber. The hole is so placed that the mass will balance when swung out by the crane. The bolts which unite the cylinders and valve chambers, having been slackened, the high-pressure cylinder comes away, practically leaving its cover bolted to the low-pressure cylinder. The joint between the valve chambers is made with gland and stuffing box. The piston-rod packing is an adaptation of that used in marine practice, which permits of a certain amount of side and vertical motion.



Smoke Box Crane.

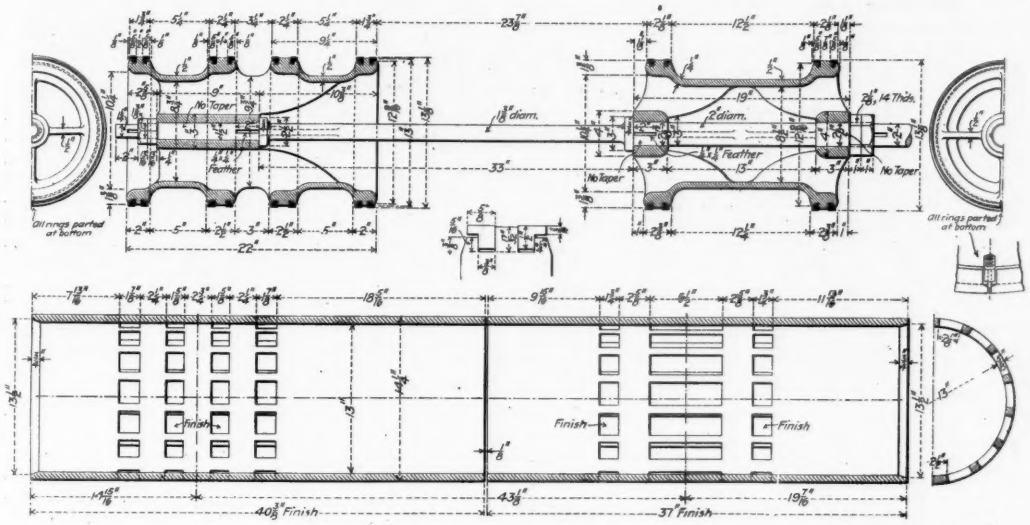


Details of Attachment of Le Chatelier Brake.

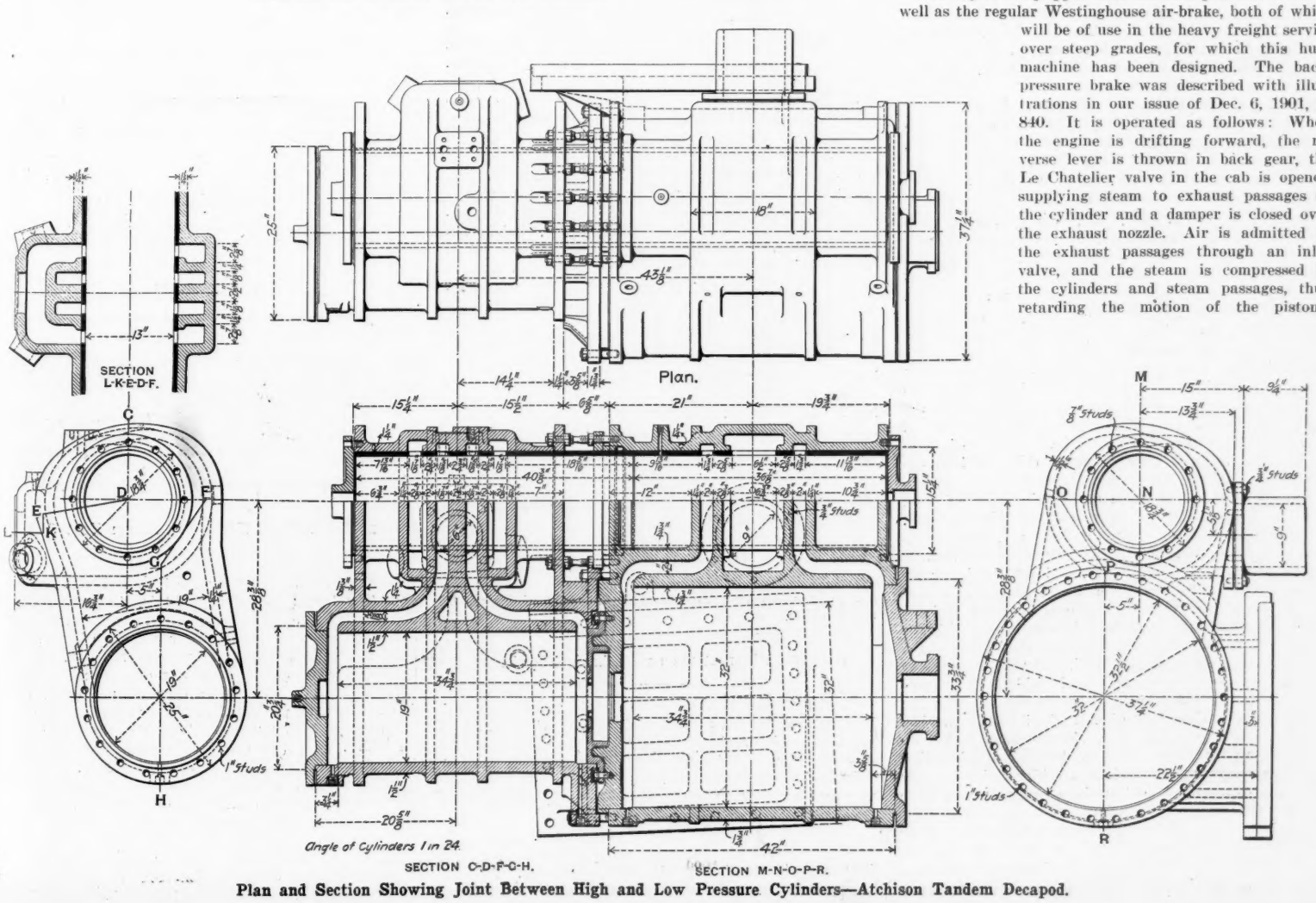
The steam chest piston valves present some interesting features. The high and low-pressure valves are on the same rod. The high-pressure is what may be called a double inside admission valve. In the tandem type of engine it is necessary to regulate the flow of steam, alternately from the front of the high-pressure cylinder to the back of the low-pressure, and from the back of the high, to the front of the low-pressure cylinder. The high-pressure exhaust escapes into the interior of the high-pressure valve, and fills the long valve chamber, which thus forms a receiver. The low-pressure valve is of the outside admission type, and is practically an ordinary D-slide valve in its action.

A feature of the high-pressure valve is that for a brief period, each stroke, the exhaust cavity of the valve communicates with both ends of the high-pressure cylinder, so that just before admission at one end, the clearance and steam-way is filled with steam at receiver pressure. The low-pressure valve does the same thing. The object of this arrangement is economy. Passages and clearance being full of steam, ready for port opening, less live steam is used each stroke.

The engine is equipped with the back-pressure brake as well as the regular Westinghouse air-brake, both of which will be of use in the heavy freight service over steep grades, for which this huge machine has been designed. The back-pressure brake was described with illustrations in our issue of Dec. 6, 1901, p. 840. It is operated as follows: When the engine is drifting forward, the reverse lever is thrown in back gear, the Le Chatelier valve in the cab is opened supplying steam to exhaust passages of the cylinder and a damper is closed over the exhaust nozzle. Air is admitted to the exhaust passages through an inlet valve, and the steam is compressed in the cylinders and steam passages, thus retarding the motion of the pistons,



High and Low Pressure Valves, with Bushing.



Plan and Section Showing Joint Between High and Low Pressure Cylinders—Atchison Tandem Decapod.

and through the medium of the connecting rods retarding the wheels. The accumulated pressure can be relieved through a gate valve, which is operated by a lever in the cab, so that the engineer can control the pressure to suit existing conditions. A safety valve is placed in the cylinder saddle to protect the passages against excessive pressure. The use of the back-pressure brake avoids the application of the full power of brakes to the tires, resulting in a saving of wear to tires and brake-shoes. The 2½-in. iron exhaust pipe, shown in our engraving last December as passing down below the under side of high-pressure cylinder, has been changed, and now passes up round the smoke-box, as will be noticed in the half-tone illustration. The principal dimensions of this engine are as follows:

Description.	
Type	Decapod
Name of builder	Baldwin Locomotive Works
Name of operating road	A., T. & S. F.
Gage	4 ft. 8½ in.
Simple or compound	Vauclain tandem compound
Kind of fuel to be used	Bituminous coal
Weight on drivers	237,800 lbs.
Weight, total	267,800 lbs.
General Dimensions.	
Wheel base, total, of engine	29 ft. 10 in.
Wheel base, driving	20 ft. 4 in.
Wheel base, total (engine and tender)	59 ft. 6 in.
Height, center of boiler above rails	9 ft. 10 in.
Height of stack above rails	15 ft. 6 in.
Heating surface, fire-box	210.3 sq. ft.
Heating surface, tubes	5,155.8 sq. ft.
Fire brick tubes	23.9 sq. ft.
Heating surface, total	5,390.0 sq. ft.
Grate area	58.5 sq. ft.
Wheels and Journals.	
Drivers, number	10
Drivers, diameter	57 in.
Truck wheels, diameter	29¼ in.
Journals, driving axle, size	11 x 12, others 10 x 12 in.
Journals, truck axle, size	6½ x 10½ in.
Cylinders.	
Cylinders, diameter	19 and 32 in.
Piston, stroke	32 in.
Boiler.	
Boiler, type of	Wagon top
Boiler, working steam pressure	225 lbs.
Boiler, diameter of barrel	78¾ in.
Crown sheet stayed with	Radial stays
Fire-box.	
Fire-box, length	108 in.
Fire-box, width	78 in.
Fire-box, depth front	80 in.
Fire-box, depth back	78 in.
Fire-box, material	Steel
Fire-box, thickness of sheets	⅝ in.; tube, ½ in.
Fire-box, brick arch	Yes
Fire-box, water space, width	Front, 4½ in.; sides, 4 in.; back, 4 in.
Tubes.	
Tubes, number	463
Tubes, material	Iron
Tubes, outside diameter	2¼ in.
Tubes, length over sheets	19 ft. 0 in.
Other Parts.	
Stack, least diameter	15½ in.
Stack, greatest diameter	16½ in.
Stack, height above smoke-box	2 ft. 3½ in.
Tender.	
Tank capacity for water	7,000 gals.
Coal capacity	10 tons
Diameter of truck wheels	34¼ in.
Diameter and length of axle journals	5 x 9 in.

M. C. B. Coupler Defects.

Following are extracts from the discussion of the paper on "A Diagnosis of M. C. B. Coupler Defects, Based on Results in Service," presented by Mr. R. D. Smith at the May meeting of the Western Railway Club, and published in our last week's issue:

Mr. G. E. Parks (Michigan Central): Regarding the breaking of pivot pins, this is practically the same difficulty that has been experienced on the Michigan Central, and in order to overcome the difficulty of losing the pivot pin and breaking the top lug, we have devised a scheme whereby the failures from these causes are expected to be reduced to a minimum. The pivot pin, instead of being inserted from the top, has no head on it, and can be inserted from the bottom as well as from the top. Arrangement is provided for supporting it from the bottom which prevents the pin being lost when the couplers are shifted. We hope by using this device to eliminate the number of broken lugs and pins, and to reduce the number of failures caused by losing the pivot pins.

Mr. J. H. McPartland (Chicago, Burlington & Quincy): I find that the breaking of the pivot pins is in a great measure chargeable to the rough usage of the cars in switching. One of our principal officials asked my opinion some time ago as to the best type of automatic coupler. In answer I stated that we have no automatic coupler. Where an engine with three cars backed up to a loaded train, or a train that had been made up, then the couplings would probably be made, but when they back up against a single car, the chances were that the coupling would not be made. We took 20 empty cars and separated them, and set the brake on each car, spacing them about a car-length apart; out of 19 couplings there were only two that would make a coupling by backing up against the empty car with the brake set. In all the other couplings we had to use a pole pin or a coupling pick and, after the cars came together, jar the drawbars and the knuckle with the pole pick or a pin in order to get them close enough for the lock and pin to drop in behind the heel of the knuckle. I believe that a great saving could be accomplished if we spent a little more money on the type of drawbar that we use and give the knuckle a machine finish so that when the cars come together the knuckles would close and the lock and pin drop in.

Mr. P. H. Peck (Chicago & Western Indiana): After our engines were equipped with the M. C. B. couplers we had the same difficulty of breaking the top lugs, caused by the pin breaking. We also had some difficulty at first by the engines not coupling, but our engineers got over that by oiling them just the same as the rest of the engine, and we did not miss near the couplings that we did before on engines. Knuckles should be oiled.

Mr. H. G. Hetzler (Chicago, Burlington & Quincy): The point has been made that oftentimes cars do not couple when thrown together; we have had that trouble and we have that trouble still. We have avoided it to an extent by putting oil on the couplings. We had to resort to this method at our freight house, where we had a long string of cars standing on the tracks where it was not best to give the cars a very hard jolt on account of the bumping post.

Mr. J. A. Carney (Chicago, Burlington & Quincy): One thing that we should be very careful about in our specifications for knuckles is to see that the pivot-pin hole in the knuckle is either reamed or drilled out.

Mr. W. E. Sharp (Armour Car Lines): I do not believe we fully appreciate the amount of damage that is to-day being done in switching yards on account of the rough usage in coupling, as has already been mentioned; perhaps because the couplings fail to meet when the cars are handled more carefully, it is necessary to switch at high speed to accomplish the desired results, and also it is necessary to throw the cars together with a terrific force in order to make the couplings under all conditions. I think we should pay more attention to the locking parts of the drawbar, and, if necessary, keep them carefully oiled. It seems to me we ought to give as much attention to this as to the oiling of the journals.

Mr. F. H. Clark (Chicago, Burlington & Quincy): Mr. Smith's paper is a very interesting one, and a very important one. He refers to the point brought up by Mr. Peck, that there has been no change in the essential dimensions or strength of the couplers originally made. I am hardly ready to concede that; I think we are getting better couplers than we ever did and that although there have been no marked changes in the size or proportion of the couplers, they are better designed now and made of better material. The fact that coupler failures are increasing is due, I think, largely to the fact that cars are not handled so carefully as they were during the time that we were using a number of link and pin couplers mixed with the M. C. B. Mr. Smith shows pretty clearly that top-lug failures are an important element in the question, and it seems to me that considerable might be done to improve the couplers in this respect. The quality of the steel used is perhaps not looked after carefully enough, and I think that aside from improvement in the quality of steel we might increase the size of the pin a little, and perhaps make the lugs a little thicker to make up for the loss of the section due to the larger pin.

Mr. Smith's table shows pretty clearly that, as far as the Burlington is concerned, the mileage per coupler failures is decreasing. It shows about 385,000 miles per coupler failure between June 1 and Nov. 30, 1900; 345,000 for the six months between Dec. 1, 1900, and May 31, 1901, and 311,000 from June 1 to Nov. 30, 1901. Now, to go into the thing a little more extensively, we find further interesting information is obtainable for data. For instance, we find that mileage of couplers on cars of the Burlington system is 3.2 times that of the mileage per coupler failure of foreign cars, that is, cars belonging to roads other than the Burlington, and that the mileage per coupler failure on the Burlington cars is 6.2 times the mileage of private line cars on the Burlington system, or on the Chicago, Burlington & Quincy rather.

Mr. F. W. Sargent (American Brake-Shoe & Foundry Co.): Mr. Smith's paper shows that a great many of the coupler failures, that is, the lug failures on the drawbar, are directly traceable to buffing blows, and in another paper that is going to be read here this afternoon there is a record of a buffing blow of 150 tons. As for new couplers that are furnished by the manufacturers, I am not quite sure that the knuckle will open freely and close freely, and that the workmanship is all right, but it is only after the couplers have been in service some time and receiving the blows running up to 150 tons that the knuckle pin is bent and finally broken. It simply emphasizes the necessity of having a backing of some kind behind the coupler to take that blow before it is communicated to the car; in other words, a resisting force that will act in the way of a buffer.

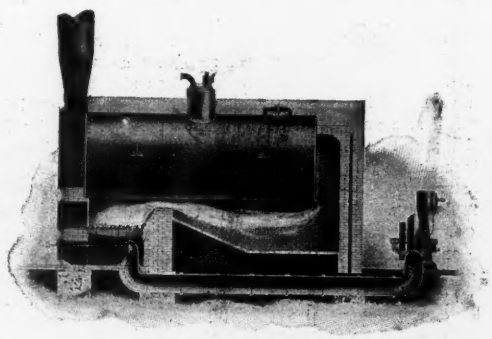
Twenty-five per cent. of the coupler failures noted in Mr. Smith's paper are lug failures; 75 per cent. are directly traceable to causes in the locking part or in the knuckle itself, some of which can be obviated by closing the slot in the knuckle and making that strong enough to resist the blows; this cause of failure would seem to be an excuse for the introduction of automatic emergency knuckles as a safeguard in the case of failure of the knuckle.

Some Observations on Mechanical Draft.

The advantages of mechanical draft, may in general be stated as, the independence of atmospheric conditions, regulation, adaptability, economy of space, smoke prevention, omission of chimney, portability, cheapness in first cost, smaller operating expenses, the use of cheaper fuels, increased combustion, combustion efficiency, utilization of waste gases and smaller boiler plant.

Everyone knows that the intensity of natural draft is dependent upon the difference between the temperature in the stack and that of the surrounding air. As both these temperatures are extremely variable, such draft cannot be constant. The draft may even vary 25 per cent. on account of sudden atmospheric changes. Mechanical draft is uniform, as its intensity is dependent only upon the speed of the fan. It is in this possibility of fan adjustment, and consequent variation of draft intensity, which renders mechanical draft a desirable feature for street railroad or electric light power stations. In these plants, where the load on the engine is variable, and where steam producing necessarily varies in accordance with the work of the engine, regulated mechanical draft seems to admirably fit the case. On an emergency, it is possible to carry heavy overloads on the engine which could not be carried with natural draft.

One of the most serious drawbacks with natural draft is that, on account of it being dependent upon the intensity of the fire, the draft is least when the fire is low, and that is the time when the strongest draft is needed. With mechanical draft, changing the speed of the blower,

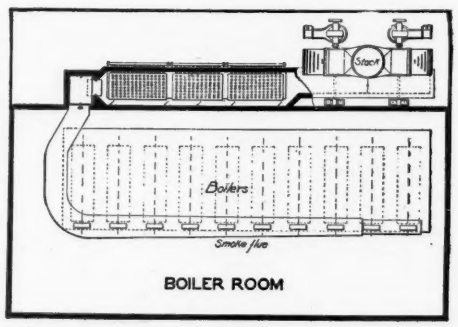


Forced Draft.

simultaneously alters the volume of air supplied to the fires, and its pressure as well. By placing a regulating valve on the steam pipe of the engine driving the blower, the draft can be automatically controlled by the steam pressure in the boiler. As the steam pressure goes down, this valve slowly opens and admits more steam to the blower engine, thus increasing the speed and thereby increasing the draft for the boiler. If the steam pressure rises, the action of the valve is, of course, the reverse. In this way it is possible to keep the steam pressure in the boilers practically constant.

The blower is very easily adapted to any location, and lends itself readily to any alteration that may be made in the steam plant, while a chimney once it is up, is practically a fixture. A chimney requires a substantial and costly foundation, while a blower can be set on top of the boiler, hung from the roof or placed in an adjoining room. To sum up these differences in a word, the cost of the foundation for the largest blower and engine is small, compared with the cost of the foundation for even a moderately sized chimney. For a temporary steam plant, the blower is obviously more suitable.

Initial cost also is almost invariably in favor of mechanical draft, so much so, indeed, that generally, the



Induced Draft Plant Harrisburg Steam Heat & Power Company.

saving effected will pay for the installation of economizers. The larger the steam plant is, the greater will be the proportionate cost of stack and foundation, as against fan and engine equipment. For a plant of the average type, forced draft appliances with short stack, costs less than 25 per cent. of the cost of a chimney; a single fan induced draft outfit is less than 40 per cent., and a double fan outfit is less than 50 per cent. of the cost of an ordinary brick chimney. A double fan system is only necessary, where the service is continuous, such as that in electric light and street railroad plants. In these stations one fan is in reserve, while the other is running.

When it comes to the cost of operation, many will argue that mechanical draft is the more expensive of the two methods. With natural draft when the chimney is up, they say it requires no power to produce the draft, while mechanical draft certainly requires power. In answer to this, it may be urged that the steam for the

blower engine is seldom more than 1 per cent. of the steaming capacity of the boilers, and only about one seventy-fifth of the heat required to produce the same draft by stack. Furthermore, the exhaust from the fan engine can be used to heat the feed water, or employed in heating the building. Cheaper fuel can be burned, or more heat extracted from a good quality of coal, thereby lessening the consumption of fuel for a given output. In many cases this means a saving of more than 40 per cent. in the cost of coal. When a very poor grade of fuel is used, mechanical draft seldom increases the consumption 50 per cent. above the consumption with good coal and natural draft. Cheap fuels generally cost less than half as much as good quality steaming coal, and it is easy to see how in the majority of cases a saving of at least 25 per cent. can be accomplished.

When an economizer is installed, the efficiency of a chimney is likely to suffer. The economizer being a heat abstractor, lowers the temperature of the flue gases, and applies the heat so taken to increasing the temperature of the feed water. It is upon high temperature of flue gases, that the stack depends to do its work most efficiently, and as the gases cool, the effect of varying atmospheric conditions upon the draft is more marked. Unless the stack is very high, a sort of mechanical robbing Peter to pay Paul goes on between economizer and stack, the full efficiency of one minimizes the useful effect of the other.

The actual saving in fuel by an economizer is from 10 to 16 per cent., depending upon type and conditions of operation. The economizer is concerned in cooling the flue gases, and when the blower is used to produce draft, it operates just as efficiently with cool, as with hot gases. There being no antagonism between the functions of economizer and fan, each works independently of the other, to produce an economical result.

A properly designed mechanical draft plant gives out little or no smoke, and in places where smoke ordinances are enforced, the advantages of such a system are obvious. When draft is dependent upon a stack, it is found that the rate of combustion is rarely more than 25 lbs. of coal per sq. ft. of grate surface. Even at that rate, the stack required to maintain it is generally such a huge affair and has been so expensive to build, that a higher rate of combustion is practically an impossibility, without resorting to some other method of draft production. By using a fan or blower it is possible to get a rate of 120 lbs. of coal per sq. ft. of grate surface. A rate of 40 to 50 lbs. is very common. Increased combustion means greater steaming capacity, and the horse power output of a boiler plant can be readily increased from 25 to 100 per cent., at the small additional cost necessary for the installation of mechanical draft.

In considering the question of mechanical draft, a difference of opinion may exist as to the relative merits of induced draft and forced draft. In general, however, it may be stated, that induced draft is preferable, for the following reasons. Induced draft will give a more even fire than forced draft will, and the former method is less likely to give trouble by the formation of holes, or patches burning in certain spots. Forced draft has a tendency to drive gases and ashes out of the fire doors and ash pit doors when either is opened, unless the air has been shut off. This objection cannot be urged against induced draft. Induced draft also assists in the ventilation of the boiler room, while forced draft tends to fill it with noxious gases. The deposition of soot or ashes in the flues is less with induced, than it is with forced draft. Induced draft permits the use of larger economizers than can be employed where forced draft is in operation. On the whole, induced draft appears to possess all the advantages of forced draft for handling fires and producing steam under adverse conditions, with none of its disadvantages. In the matter of cost of installation, it must be admitted that, owing to the difference in the size of fans, for a given steaming capacity, the scale turns somewhat in favor of forced draft. In some cases, the smaller space occupied by a forced draft apparatus, makes it an advantageous one to use. As far as cost of operation goes, there is not much choice between the two. Induced draft cannot be employed in connection with under-feed mechanical stokers, or with hollow grate bars. In marine work, and especially in warships, forced draft is almost invariably used because of the smaller space occupied.

A very good example of an induced draft installation, is that represented in the illustrations. They show the boiler plant of the Harrisburg, Pa., Steam Heat and Power Co. as equipped by the American Blower Company of Detroit, Mich. A very clear idea of the general arrangement of boilers, economizers, fans and engines may be had by a glance at the cuts, which show how this form of mechanical draft is adapted to such plants.

A High Tension Transmission Line.

The 50,000-volt transmission plant of the Missouri River Power Company is a recent remarkable development in electrical power transmission over a long distance, and in the use of high voltage. This installation was completed and the apparatus put in operation about the first of March. Since the starting of the plant there has been no mishap of any kind to the line or apparatus. The present power-house of the Missouri River Co. is located on the Missouri River about 20 miles east of Helena, Mont., in what was once known as Black Rock Canyon. At the mouth of the canyon lies the town of Canyon Ferry and the power-house of the Missouri River Power Co. A general view of the power-house and town is given in Fig. 1. At the mouth of the canyon a dam has been thrown across the river about 480 ft. long, designed to give a 30-ft. head of water. At the upper end of the canyon the water spreads out over the valley, forming a lake about seven miles long by two to three miles wide. The canyon by which the water comes to the power-house is from 400 ft. to 700 ft. wide, and less than one-half mile long. No difficulty is experienced from ice in winter, although the lake above freezes over. The amount of water in the lake at this point is considered sufficient to develop 10,000 h.p. the year around.

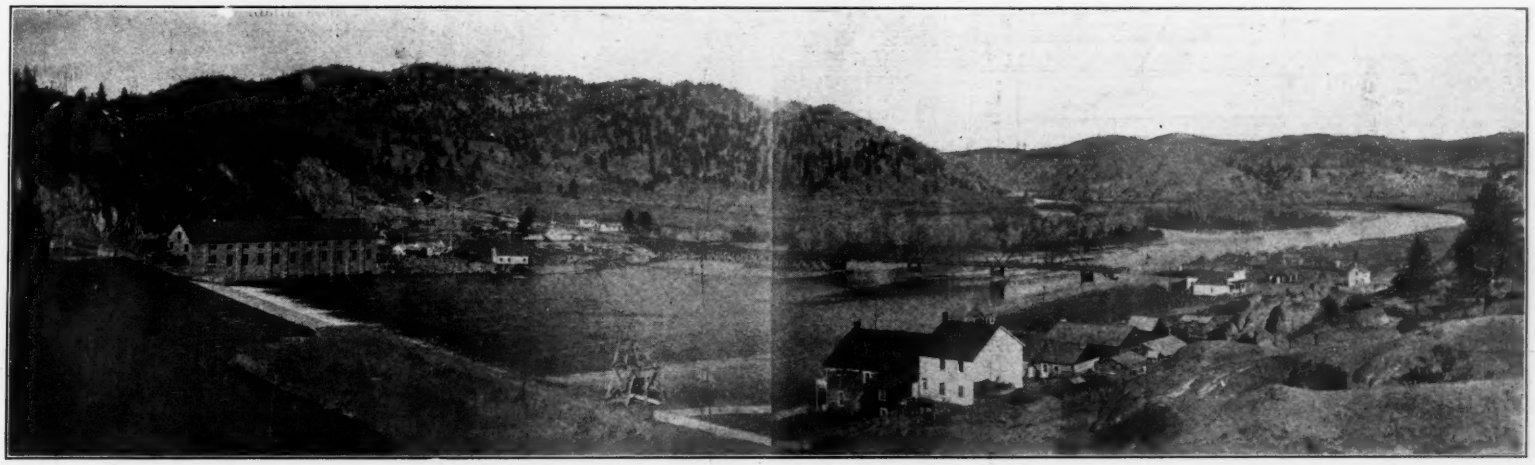


Fig. 1.—General View of Power House and Surrounding Country.

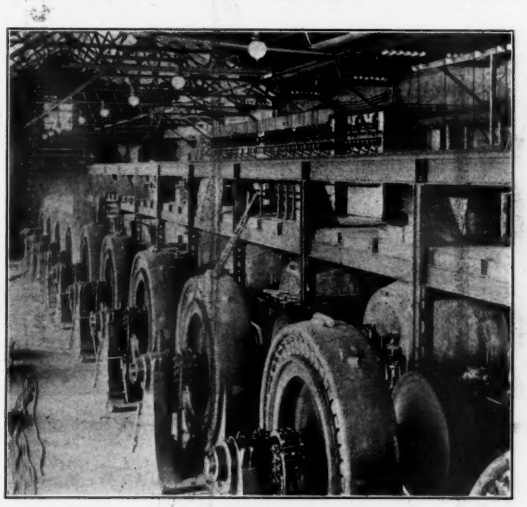


Fig. 2.—Interior of Power House.

About four years ago work was started on a plant of 4,000 h.p. at Canyon Ferry. This plant consisted of four 750 K.W., 550-volt, two-phase Westinghouse generators, driven by Dayton Globe Iron Works' water-wheels, with two 90 K.W. exciters, driven by independent wheels. The current from these generators was raised by transformers from 550 volts to 10,000 volts, and sent to Helena and East Helena, 20 miles away. The line between Canyon Ferry and Helena consists of but one pole line, carrying four independent circuits; one to East Helena, one to the Peck concentrator and two to Helena.

In the fall of 1900, work was begun on an extension of the company's plant, to a capacity of 10,000 h.p., by putting in additional generators with exciters and transformers, and the service was extended to Butte, Mont. To this end the company installed six additional 750 K.W. Westinghouse generators, of the same size and voltage as the first four, but three-phase instead of two-phase. The water-wheels are 45-in. horizontal McCormack wheels, direct connected to the generators through flexible couplings. The power plant now consists of ten 750 K.W. direct connected three-phase generators, with four exciters, the four old generators having been overhauled and changed from two-phase to three-phase. Fig. 2 shows the row of generators and turbines. Each water-wheel has its own governor, seven being equipped with Lombard governors and three with Replogle governors. The switchboard gallery extends the whole length of the building, and, besides carrying the switchboards carries 12 transformers for the Helena and East Helena service. The main switchboard is 47 ft. 4 in. long, and consists of 17 panels of blue Vermont marble. The weight of the board complete is about 20 tons, the copper alone being one-half of this weight.

The distance by pole line from Canyon Ferry to the Butte sub-station is 65 miles. The line consists of two lines of poles about 50 ft. apart, the cables being arranged in an equilateral triangle, with a space of 78 in. between centers, and each line consists of three seven-strand copper cables, each cable having a cross-section of slightly over 106,000 c.m. The average distance apart of the poles is 110 ft. The transformers at each end of the line consist of six 950 K.W. oil-insulated transformers. Those at Canyon Ferry transform from 550 to 50,000 volts, and at Butte the step down is made from 50,000 to 2,200 volts.

M. H. Gerry, Jr., Engineer of the Company, planned and executed the work. All the electrical apparatus in this plant was furnished by the Westinghouse Electrical & Manufacturing Company.

Revision of Chicago Traction Systems.

The first move toward a revision of the traction systems in Chicago was made last week when the Transportation Committee of the City Council chose Mr. Bion J. Arnold, of the Arnold Electric Power Station Co., Chicago, to submit reports and plans for a complete revision of the street railroad systems. A number of franchises of traction systems expire in 1903, furnishing opportunity for a betterment of the present unsatisfactory conditions.

The engineering proposition involved is one of considerable magnitude, including numerous difficult problems. In the first place there must be submitted a complete plan of reorganization of the various street railroads. An estimate of the cost of production of a new system adequate for the required service and in accordance with the very best practice must be made, including probable net earnings based on the present business. The desirability and practicability of an underground conduit system in the business district is to be considered, together with arrangements for transferring from the overhead to the underground trolley. Plans for re-routing the present lines outside of the business district in a manner to afford the best transportation facilities must be prepared. Also preliminary plans for a system of subways in the business district having surface terminal facilities must be drawn up.

Additional problems involved and which must be fully considered in the general revision scheme are as follows: To show the necessity for the abandonment of the practice of operating cars in trains; make an estimate of the value of all lines whose franchises do not expire in 1903; report on the desirability of through routes as against down-town terminals; report on the advisability of joint use of tracks by the companies; report on the possibility and cost of converting cable lines into underground trolley lines; report a plan for the rearrangement of the Union Loop; report a plan for the prevention of electrolysis; give an estimate of the cost and report on the advisability of laying cement roadbeds; report the cost of operation and the earnings of the present street railway companies; report on the capitalization of the present companies; give the valuation of the present plants; estimate the number of passengers carried during different hours of the day; report on the wages paid employees, and the rules and regulations under which they work, and make recommendations for changes; submit a design rail to be used in the future.

There are some other questions which are related to the main issue and which must be included in the consideration of the traction problems. One of these is the question of sewers. An enlargement of the sewers in the business district will probably be necessary within a few years at most, and in connection with plans for

the building of subways the matter would require attention. Also the possibility of utilizing the Drainage Canal as a source of power will be considered.

Mr. Arnold, who has the work in charge, is now engaged on a plan for electrically working the suburban trains of the New York Central in and out of New York City, a difficult problem. He is also Consulting Electrical Engineer for a number of other railroads.

Car Service Managers' Meeting.

The Thirteenth Annual Meeting of the National Association of Car Service Managers was held at Charleston, S. C., May 20 and 21. Secretary A. G. Thomason presented a comparative summary of the usual quarterly statements of the Association, showing:

Number of cars reported in 1901	19,617,500
Number of cars reported in 1900	17,744,103
Average detention by railroads in 1901, per day per car.	0.38
Average detention by railroads in 1900, per day per car.	0.36
Average detention by the public in 1901, per day per car.	1.38
Average detention by the public in 1900, per day per car.	1.37
Total average detention in 1901, days per car.	1.72
Total average detention in 1900, days per car.	1.68

The estimated average detention to cars prior to the establishment of car service collections was 6.17 days per car; as compared with this there was gained, therefore, in 1901, the service of 19,617,500 cars for 4.45 days, or 239,172 cars for every day in the year.

Supplement No. 2 to "Legal Decisions in Car Service Cases" has been published. It has a report of a notable decision in support of demurrage rules by the Supreme Court of the State of Pennsylvania, in the case of the Pennsylvania Railroad Company vs. The Midvale Steel Company.

The Convention was marked by interesting and profitable discussions on several subjects of general interest to the members. Among the most important was "Storage in Connection with Car Service." This subject was suggested by Mr. C. W. Sanford, Manager of the Chicago Car Service Association, who asked for information. His Association, under the direction of the General Managers' Association of Chicago, has adopted a new set of rules, effective July 1 next, covering storage of freight in warehouses, under the direct supervision of the Car Service Association. The discussion was led by Mr. P. R. Albright, Manager of the North Carolina Car Service Association, who explained the operation of storage rules in his territory, covering freight in railroad warehouses. He said that his regulations gave great satisfaction, and resulted in keeping the houses clear. The agents and railroad officials would not now think of doing without them. Other valuable information as to details and results was given by Managers Taylor, of the Virginia; Haskell, of the Georgia, and Hoskins, of the Louisiana associations. These storage rules are now enforced by nearly all of the car service associations south of the Potomac and east of the Ohio rivers, and as Chicago has now made a beginning it seems likely that the movement may spread to other Northern and Eastern territory.

Mr. C. B. Peck, Manager of the Texas Car Service Association, read a paper on "The Relation of Per Diem to Car Service Associations." This subject was discussed with great interest by all of the members present. As yet no one seems to have any fixed ideas as to what may be done in this connection; but it was thought that per diem interchange rules might result in the strengthening of demurrage regulations by including territory and stations not already covered; and by the adoption of uniform construction and application of existing rules by all demurrage associations; and it was the consensus of opinion that the ideal car service rules should allow but 48 hours free time on all commodities; and they should cover all freight in car loads, including company's material.

Mr. J. E. Challenger, Philadelphia Association, was elected President for the ensuing year; the Vice-President is Mr. A. J. Elliott, Illinois Car Service Association, and the Secretary is Mr. A. G. Thomason, of Scranton, Pa. The Executive Committee for the ensuing year, as appointed by the President, consists of J. C. Haskell, Atlanta; A. L. Gardner, Baltimore, and C. W. Sanford, Chicago. The Association voted to hold its next annual meeting in Chicago in June, 1903.

Pensions on the Reading.

The Philadelphia & Reading announces that superannuated employees are to be pensioned. The date when the regulations are to go into effect is not stated. An officer says:

This pension system is intended to supplement the Philadelphia & Reading Relief Association, but it is not confined to members of the Association. A similar pension system will be adopted by all of the transportation companies which the Reading owns or controls.

The following classes are affected:

(a) All employees engaged in any capacity in the operations of the company who have attained the age of 70 years shall be retired, and, if they have been 30 years in the service, shall be pensioned; but this clause is not mandatory in its application to executive officers appointed by the Board of Directors.

(b) All employees 65 to 69 years of age, both inclusive, who have been 30 or more years in the service, and who have become incapacitated, may be retired and pensioned.

The monthly allowance will be: For each year of service 1 per centum of the average regular monthly pay for 10 years next preceding retirement.

The Pension Board may, in case a faithful employee has received injuries which totally incapacitate him, award him such sum, as a pension, for such length of time as said board shall determine.

No person shall be taken into the service of the company who is over 35 years of age, except that, with the approval of the Board of Directors, former employees may be re-employed within three years; persons may be employed on account of special qualifications, or temporarily, and persons in the active service of any transportation company owned or controlled by the Reading may, irrespective of age limit, be transferred.

The Timber Preserving Plant of the Great Northern.

In the *Railroad Gazette* for March 8, 1901, brief reference was made to the tie preserving plant that the Great Northern was building near Kalispell, Mont., on Flat Head Lake. This plant was completed last fall and has been in operation during a part of the winter. It is one of the largest in the country, there being but two larger, and has an annual capacity of 1,200,000 ties, or 4,000 a day. The timber available in this territory is bull-pine, similar to Norway pine, tamarack, fir and some spruce; a large saw mill has been built in the vicinity to supply the treating plant. There is altogether about 600 miles of shore along the lake and adjacent rivers from which the timber supply may be drawn, and a large tract of timber land in the neighborhood of the plant is owned by the railroad company.

In general the plant consists of the retorts, in which the ties are subjected to treatment, the tanks for storing the solutions, and the power plant, which also furnishes heat and light. The general layout is shown in Fig. 1. Fig. 2 gives a general view of the plant taken after three of the retorts were in place. An interior view of the power plant is shown in Fig. 3. Accessory appliances include an elaborate system of piping and valvage; tram cars (Fig. 4) and tracks for moving the material, with an engine, drum and cables to furnish the motive power; mixing vats for preparation of the solutions; derricks for handling the material; and scales for weighing the untreated and treated timber.

The retorts, of which there are four, are 108 ft. 6 in. long and 6 ft. inside diameter and are capable of accommodating 13 tram cars loaded with 8-ft. ties. They are made of ⅝-in. steel plates, having double-riveted horizontal, and single-riveted circumferential seams. They rest in timber saddles bearing upon concrete foundations, and are provided with a special design of spider

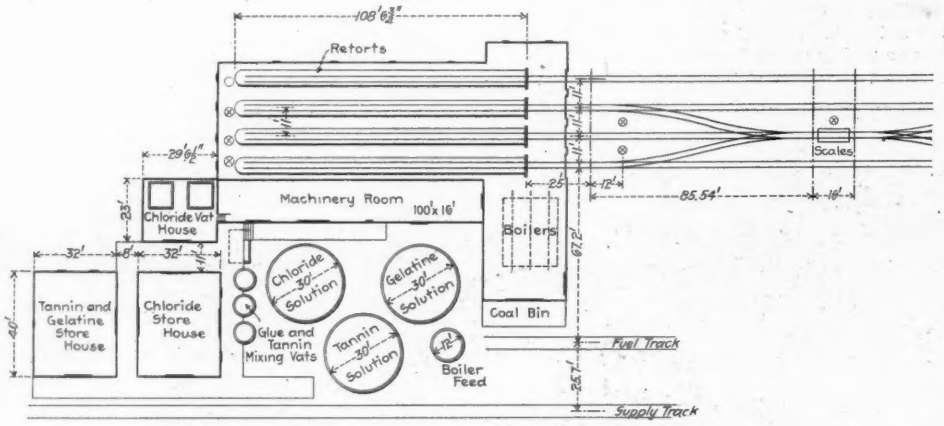


Fig. 1.—General Layout—Great Northern Timber Preserving Works.

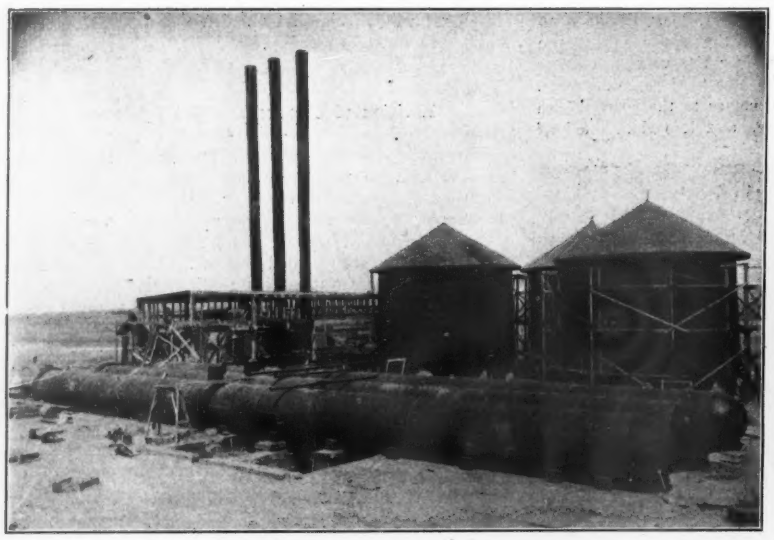


Fig. 2.—View Showing Three Retorts in Place.

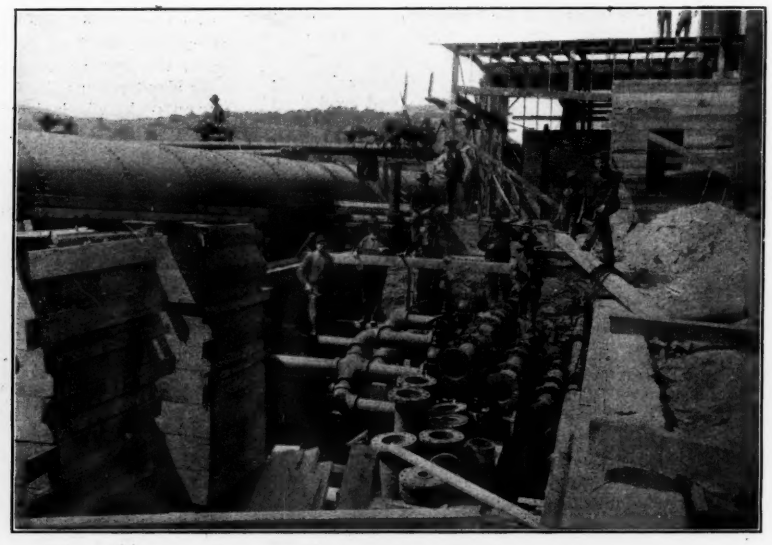


Fig. 5.—A Part of the Piping System—Great Northern Tie Preserving Plant.

door for sealing the entrance and which is fitted to resist pressure and prevent leakage and waste. Each retort contains a track for the tram cars and on which the charges are run in and out.

The process employed is known as the zinc-tannin or

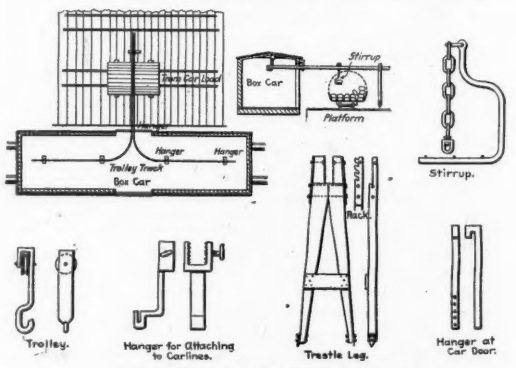


Fig. 6.—"Angier" Tie Loader.

Wellhouse, and three separate solutions are used in course of treatment. The first of these is zinc-chloride; then gelatine or glue, and lastly tannic acid. The tanks for storing these solutions are shown in the plan, Fig. 1, and again in Fig. 2. Built of wood and iron bound, they are 30 ft. in diameter and 20 ft. high, with a capacity

of 100,000 gallons. A smaller tank seen in Fig. 1 is for the boiler feed water.

The power plant contains a battery of three 72-in. return tubular boilers, aggregating about 300 h.p. In the machinery room are a Knowles duplex vacuum pump, 14 x 9 x 10 in.; four Knowles duplex pressure pumps, 6 x 3½ x 6 in.; a Wheeler surface condenser having 700 sq. ft. of coaling surface; and a Knowles air compressor, 10 x 8 x 8 in., having a capacity of 210 cu. ft. of free air per minute. A low air pressure is used, anything over 15 lbs. answering, as the head against which such radiators as are required to heat the buildings; also water pipes for fire service.

The buildings are of wood but are substantially built, with a view to affording ample protection against the severities of the climate.

The 4,000 ties a day that the plant is capable of handling are treated in two lots of 2,000 each, or 500 to the retort per charge. After the ties are loaded on the tram cars they are run into the retorts and steam is introduced. The pressure is not allowed to exceed 20 lbs., as the temperature is then near 250 deg. F., which is all

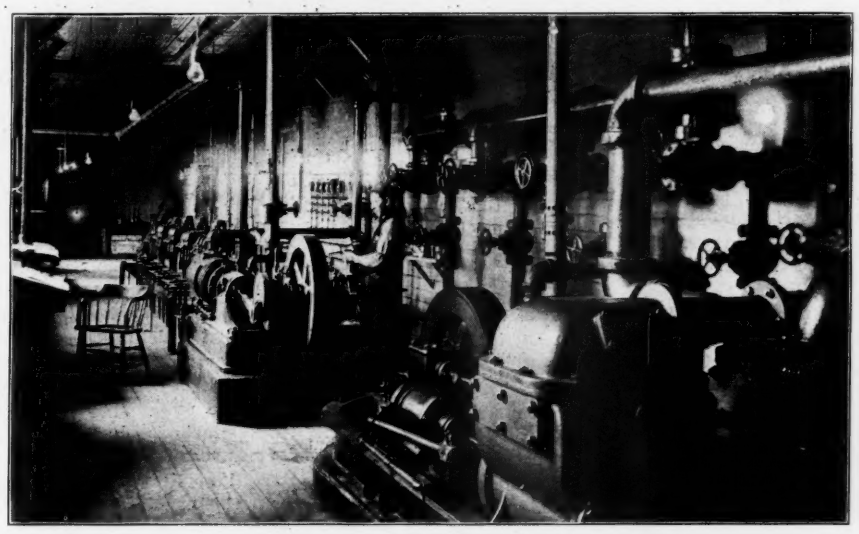


Fig. 3.—Interior View of Power Plant (Machinery Room)—Great Northern Tie Preserving Plant.

it acts is never more than 15 or 20 ft. There is also an electric plant for furnishing light and power. The installation was made from equipment used in the Cascade tunnel work of the Great Northern and is 500-volt direct current apparatus. Two small General Electric mining-type locomotives are used for hauling the tram cars to and from the retorts, and there is a small motor car for moving ties about the plant. For lighting, 110-volt lamps are used, five being connected in series. The equipment is not satisfactory and it is intended to improve it in the near future.

What is known as the "three-movement" process is employed in this plant and requires an elaborate system of piping. Some idea of its complicated nature may be obtained from Fig. 5, which also gives an excellent idea of the magnitude of the scale of the installation. The pipes shown are the solution pipes and are 10 in. in diameter to the headers and 8 in. between headers and retorts. They connect the solution tanks with the retorts and are in control of one operator by a properly

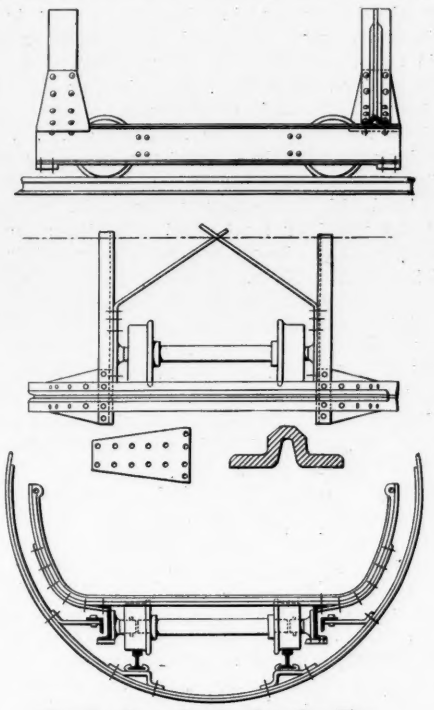


Fig. 4.—Tram Car for Carrying Ties.

arranged system of valves. Air and vacuum pipes connect the compressor and vacuum pumps to the retorts. Through these a vacuum can be produced in a retort, or compressed air introduced to force the solutions back to the storage tanks; also steam or air may be released from the retort. There are in addition to the above, which are the most important systems, a blow-back system of small pipes for forcing back the last remnant of solution into its receptacle, after the solution valves are closed; a puddler system by which compressed air is used to agitate the various solutions and preserving materials in the mixing vats and the tanks; and the circulating system for forcing water through the surface condenser; there are also steam coils and heating pipes for keeping the solutions at the desired temperature, and the timber will bear without scorching or injury to its fiber. This is maintained for some three hours and at frequent intervals during this time the condensation is drawn off through an automatic blow-off. At the expiration of the steaming period the steam is blown off and the retort allowed to cool for a short time, after which a vacuum of about 22 in. is produced and held for an hour or more, long enough to extract the sap from the timber. The hot vapors and the sap pass into the surface condenser and from there to a hot-well. After the vacuum has been on for a sufficient time while it is still held the chloride solution is allowed to flow in. After filling the retort, pressure is put on by means of the pressure pump, and raised to 100 lbs. per sq. in.; it is maintained for a length of time sufficient to meet the requirements of the timber, the average time being two hours and a half. The chloride solution having been forced back to the storage tanks by compressed air, a one-half per cent. solution of glue is introduced by gravity. It is subjected to the same pressure as the chloride solution and is allowed to remain for two hours. Following the removal of the gelatine, the tannin solution is let in and handled in a similar way to the other two. This completes the operation and the charge is withdrawn. The length of time required for treating one charge is from 10 to 12 hours.

A force of about 50 men is required to operate the plant. In order to work to its rated capacity it must be run continuously. However, the night force is small, consisting of the engineer, fireman and a door-gang, about five men altogether being able to handle it. All preparations for the night charge are made by the day force, and the loading is likewise left for the latter.

Perhaps the most severe labor connected with the operation of a tie-preserving plant is the loading of the treated ties into box cars. For economic reasons the larger part of the output is delivered in this way. As the freshly treated ties have their normal weight increased from 50 to 75 per cent., each tie weighs from 160 to 175 lbs. For two men to handle any number of these ties, the labor is very severe and great difficulty is experienced in retaining men for this part of the work. To meet this trouble the tie-loader, shown in Fig. 6, was devised by Mr. F. J. Angier, who has charge of the Burlington & Missouri River plant at Sheridan, Wyo. By its use two men can load a car very rapidly. A trestle leg is set up on the loading platform for supporting the outer end of a double-rail track which branches as it passes into the car door, running to either end. It is swung to the carlines by the hangers shown, which are fastened by a thumb screw, and have teeth to grip the wood. Another hanger, where the rails branch at the door, hooks over the door-rail and its lower end has a number of holes, through one of which a pin passes, on which the rails rest. The stirrup and trolley require no explanation. The former is hung by a chain and its height may be adjusted by placing any link of the chain over the trolley hook. The height of the trestle is also adjustable by means of the rack shown. The outer end of the track is raised several inches higher than the other so that the loaded trolley, guided by the workman, will roll into the car easily.

The timber obtained in the region in which the plant is located is of excellent quality, the trees being quite large and yielding "heart" timber, containing very little sap. Such timber is more difficult to treat than that having a less solid texture, as it is not as readily permeated by the antiseptic. It will be seen by this that the steaming is perhaps the most important step of the entire process since it depends upon how thoroughly this is done as to how thoroughly the sap, which is the cause of decay, is removed, and the solutions permitted to penetrate the wood. Ordinarily in the Wellhouse process, the gelatine is introduced with the chloride solution, requiring therefore two movements instead of three, but because the timber treated at the Great Northern works is of the nature described it was thought best to subject it to the action of each solution separately.

We are indebted to Mr. Samuel M. Rowe, Chicago, who designed and supervised the erection of the works, for the illustrations and other information pertaining to the plant.

Train Accidents in the United States in April.†

NOTE.—*An asterisk at the beginning of a paragraph indicates a wreck wholly or partly destroyed by fire; a dagger indicates an accident causing the death of one or more passengers.*

bc, 1st, 5 a.m., Baltimore & Ohio, Strasburg, Ohio, butting collision of freight trains, making a bad wreck. Two trainmen were killed and three injured. The collision was due to a mistake in giving meeting orders.

*xc, 1st, 8 p.m., Turtle Lake, Wis., a freight train of the Minneapolis, St. Paul & Sault Ste. Marie ran into a passenger train of the Chicago, St. Paul, Minneapolis & Omaha, at the crossing of the two roads, and the first three cars of the passenger train were knocked off the track. These cars took fire, and, with the station building, were burned up. One trainman was injured.

rc, 2nd, Baltimore & Ohio, Terra Alta, W. Va., rear collision of freight trains, wrecking caboose and two cars, which were destroyed by fire.

unx, 2nd, Western Maryland, Hagerstown, Md., a locomotive, running backward, was derailed and fell against a freight train moving in the same direction on the adjacent track, both moving at a fair rate of speed. Two engines and 20 freight cars were wrecked and one fireman was killed.

3rd, 5 a.m., New York Central & Hudson River, Woods Lake, N. Y., passenger train No. 655 was derailed, and several cars, occupied by immigrants, were ditched. The engine was overturned but only two passengers were injured, and they but slightly; no trainmen injured.

*o, 3rd, Chicago & Alton, Lincoln, Ill., a car of a freight train, occupied by employees of the company (mechanics), took fire while the train was running at full speed, and one of the men was burned to death.

unf, 4th, 1 a.m., Pennsylvania road, Cragdell, Pa., a freight train was derailed by a landslide, and the engine and several cars fell down a bank. Two trainmen were killed and the engineman was fatally injured.

bc, 5th, Seaboard Air Line, Method, N. C., butting collision of freight trains, wrecking both engines and 11 cars. Two trainmen were injured. The track of the Southern Ry. lies parallel to the S. A. L. at this point, and it is said that both enginemen thought that the opposing train was on the Southern Company's track.

unx, 6th, 3 a.m., Baltimore & Ohio, Toll Gate, W. Va., a car in a freight train jumped the track and, with 15 other cars, was piled up in a bad wreck. About 50 animals in the cars were killed.

†unx, 6th, 3 a.m., Grand Trunk, Milletts, Mich., eastbound passenger train No. 6 was derailed at a switch, and two passenger cars fell against the locomotive of a westbound freight standing on a side track. The cars and the engine were badly damaged. One passenger was killed and three passengers and one trainman was injured.

xc, 7th, 5 a.m., Great Northern, Winchester, Wash., eastbound passenger train No. 4 collided with a freight car which had been blown out of a side track, and the engine and seven cars were ditched. Two passengers and two trainmen were injured.

unx, 8th, Great Northern, Belton, Mont., eastbound passenger train No. 4 was derailed and the engine and first four cars were wrecked; several passengers were injured.

eq, 8th, New York Central & Hudson River, Oneida Castle, N. Y., two trains coupled together, moving eastward, were suddenly stopped by the rupture of an air hose, and two cars of cattle were crushed and thrown to one side, lodging on the westbound track. A train on the latter track ran into the wreck and 10 of its cars were badly damaged.

unf, 8th, Cleveland, Cincinnati, Chicago & St. Louis, Cleveland, Ohio, a westbound passenger train was derailed at a washout and the engine and the mail car fell down a bank. The engineman and fireman were killed.

unf, 8th, Atchison, Topeka & Santa Fe, Joliet, Ill., a passenger train was struck at the side by a street car which approached the railroad crossing at uncontrollable speed, and one passenger car was knocked off the track. The street car was wrecked and the motorman was injured.

unx, 8th, Cincinnati, New Orleans & Texas Pacific, Oakdale, Tenn., a switching engine was derailed and the fireman was killed.

dn, 10th, Boston & Maine, Wayland, Mass., a freight train was derailed at a misplaced switch and ran against a small freight house, which was pushed off its foundation. Eight cars were wrecked and two trainmen were killed. A third trainman was injured.

*rc, 11th, 5 a.m., Seaboard Air Line, McBee, S. C., a freight train descending a grade was suddenly stopped by the automatic application of the air-brakes, resulting from the train breaking in two; and while stopped was run into at the rear by a following freight, of which the engine and many cars were wrecked. The wreck took fire and was mostly burned up.

xc, 11th, 8 p.m., Pennsylvania road, Pittsburgh, Pa., an empty engine ran over a misplaced switch and collided with a switching engine; five trainmen were injured.

(Continued on page 399.)

‡Accidents in which injuries are few or slight and the money loss is apparently small, will as a rule be omitted from this list. The tabular record of totals is no longer kept, as a more complete report of the total number of accidents is published by the Interstate Commerce Commission. The classification of the accidents is indicated by the use of the following

ABBREVIATIONS.

rc	Rear collisions.
bc	Butting collisions.
xc	Miscellaneous collisions.
dr	Derailments; defect of roadway.
eq	Derailments; defect of equipment.
unf	Derailments; unforeseen obstruction.
unx	Derailments; unexplained.
o	Miscellaneous accidents.

RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.
PUBLISHED EVERY FRIDAY
At 32 Park Place, New York.

EDITORIAL ANNOUNCEMENTS.

CONTRIBUTIONS—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussion of subjects pertaining to ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

ADVERTISEMENTS—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

The per diem reform is a go. Secretary Allen, of the American Railway Association, announces that he has received enough signatures to the agreement to warrant him in declaring that the resolution of the Association, putting a per diem car-service rate into effect on July 1 next, shall become effective on that date. This means that for at least one year the great bulk of the freight-car interchange of the country will be settled for on the business-like basis of a uniform charge per day, instead of the unbusiness-like basis of a mileage rate. With the lively interest now manifest in the matter, and the intelligent and energetic management that will be given to the administrative features of the new plan, we may confidently expect that long before the year has elapsed the railroads will be practically unanimous in their desire to make the per diem plan permanent. We need not repeat here the story of the expected economy in cars, and in yard room, and the elimination of uncertainty in accounting, which give to this movement such decided importance. Whatever the outcome, the railroads are to be congratulated on making the progress that they have made thus far. It is a triumph of scientific methods over blind adherence to the precepts of the ancients. We print in this issue the report of the Car Service Managers, containing a paragraph which suggests the great saving that has been effected by collecting demurrage on freight cars from consignees; this may fairly stand as an incentive to everybody to now go on and produce a similar economy by making collections from railroad companies on the same sound principle. The next thing on the docket is to organize local committees at the large cities to take up the question of allowances on switched cars, so as to be prepared beforehand for some of the friction that is sure to arise. We do not learn that any such committees have as yet been formed; but Mr. Hale's committee is to consider this and other questions at a meeting in Cincinnati this week.

Friction Draft Gear.

In 1898, after careful observation of the performance of the Westinghouse friction draft gear in heavy service, and after much consideration of the mechanics of the subject, we said: "The performance of this gear is to be considered from two quite distinct points of view: Its duty as a buffer in stops and in yard work, and its duty while the train is in motion. Obviously, the ideal buffer for both of these duties is one that will absorb the energy of the moving mass and dispose of it so that there will be no recoil. The spring buffer cannot do this for reasons that are sufficiently apparent. . . . If the springs were made strong enough to be really useful in protecting the draft gear, the sills and other parts, the recoil would tear trains to pieces. Nobody would expect to dispose of the recoil of a great gun on shipboard by springs; if he did his gun would probably be thrown out of the ship the first time it was fired. . . . The only thing in sight is a device which will dissipate the energy of the moving masses through the intervention of friction. . . . It is probable that the further duty of this friction draft gear in taking care of the alternating strains of buffing and pulling which take place while the train is in motion on the road has not been sufficiently considered by any one unless it is by the few men who have been carefully studying the subject."

In the four years that have elapsed since we printed those words there has been a considerable draft gear history. The *Railroad Gazette* has been subjected to various forms of comment and criticism because it has persistently held to the fundamental notions laid down in the words quoted. But we have never been worried, having felt a good deal of confidence in the soundness of the mechanical conceptions briefly and inadequately expressed in the words quoted. Now, there are in the market, or undergoing experimental development, a dozen friction draft gears, and the study of this question is becoming one of the most important mechanical problems before railroad officers.

On another page is a preliminary report of certain investigations and tests that have been carried on by a committee of the Western Railway Club, particularly on the Lake Shore & Michigan Southern. It will be observed that the Committee says that trains fitted with spring draft gears broke in two repeatedly under conditions that resulted in no damage whatever to cars equipped with friction draft gears. And the Committee further points out the necessity of something more efficient than the spring draft gear commonly used.

This preliminarly report should be carefully read several times at least, not merely for what it says, but for what it implies and leads up to. It is not necessary that we should recapitulate here any of the facts stated in that report, which is short, and to which the reader can turn with little trouble. An interesting fact is apparent, however, in studying the report. It shows how difficult it is to collect information of this class; how constantly seemingly useful observations are vitiated by the introduction of unexpected variables. It shows how little we can safely infer from one set of experiments in physical inquiries of such complexity. In fact, this is one of those cases which frequently arise where the reductions made after a study of the mechanism itself, in the light of sound principles, are likely to be safer than conclusions drawn from a comparatively few experiments.

Why Use the Quick-Action Triple Valve?

The letter from Mr. Bignell, which appears on another page, brings up some ancient history. Fifteen years does not seem a long time, and yet that which happened only fifteen years ago seems to be already forgotten by some of the younger railroad men. In May, 1887, the second series of the famous Burlington brake trials was run off. Those trials, like the earlier Galton-Westinghouse trials in England, were an epoch in the art of power-braking and have become classical. From the Burlington trials came the quick-action brake.

Many of us remember the astonishment, we might almost say the consternation, which followed from the results obtained in the 1886 trials with the plain triple to which Mr. Bignell would evidently have us return for long freight trains. We quote a passage from the report of the Master Car Builders' Association, which is to be found in the volume for 1887, page 104:

"Thus toward the close of the contest the only surviving competitors were the Eames and the Westinghouse, and even with these, such violent shocks were given in stops with all 50 cars braked, that the Committee was obliged to amend its rules, and convert the 50 mixed and loaded car stops into service stops; that is to say, stops that an engineer would make in an ordinary handling of his train with a view to avoid any damage in the rear, rather than to make his shortest possible stop. It will be noted, therefore, that in these stops the engineers were allowed to shut off steam 500 ft. and 1,000 ft. before reaching the stop-post, and thus bunch the train before the stop signal was given, and even then gradual application was made in place of emergency. Had these precautions not been taken, a continuance of the shocks not only would have been exceedingly dangerous to those riding on the train, but would soon have rendered all cars unfit for service. The explanation of the violence of the shock with the continuous brakes clearly is the same as in the independent brakes, viz., successive application from the engine."

In the conclusions drawn by the committee, which may be found on page 112 of the same report, is the following passage:

"The results of these 1886 tests were disappointing. None of the competitors in the estimation of your Committee did satisfactory work, owing to the violent shocks produced in stopping. Slack in long trains controlled with power brakes applied successively from the engine, assumed at once a most prominent part in this and doubtless all future contests."

In 1887 the Westinghouse Company came to the trials with a new quick-action triple valve, and again the results were most surprising. In an editorial in the *Railroad Gazette* of May 20, 1887, we find these words: "The trials have shown that the quickest acting atmospheric brake will cause shocks quite inadmissible in ordinary working. . . . In one case the Westinghouse brake, applied by air only, to a train of 50 empty cars, when making a stop at 20 miles an hour moved the slidometer 103 inches. . . . A load of steel rails would probably slide through the end of the car. . . . A thoughtless or unskillful engineman can, by a full application of the brakes, inflict serious damage at the rear end of his train. . . . It is questionable whether . . . a mild collision . . . would not be preferable. . . . The fact that all the draw-bars hitherto fractured have been broken in tension shows that the recoil of the springs is also an element which has to be dealt with. The remedy for shocks appears to have been clearly foreshadowed by the results of the trial of the Park electric brake." The next week we wrote: "The most remarkable feature has been the general adoption of electricity, which has been proved capable of operating the valves of air-brakes so as to secure greater quickness of action, less shock and better graduation of the power applied"; and on June 3 we said: "Mr. Westinghouse declares that he is confident that he can abolish the shock without having resort to electrical application, but so far the results have been decidedly adverse to his supposition."

Those sentences were written on the ground, in the atmosphere of the occasion, in the presence of the most expert men in America (which is to say in the world) and represent the best thought of the time. Indeed, Mr. Westinghouse, for a little time, stood almost alone in his confidence in the possibility of the use of air, without electrical auxiliary, for stopping long trains. It was one of those critical moments which give opportunity to the man of genius and courage. Without both genius and courage defeat might then have come, and the art of braking might have been put back for years in efforts to make a successful combined apparatus.

Such was the situation the first week in June. In September Mr. Westinghouse was again on the classical Burlington course with a train of cars, but equipped now with a new quick-action valve. The results were again amazing. The brakes were applied at the rear of a 50-car train in less than two seconds, and the shock had disappeared. In October we wrote: "At the conclusion of those trials [the May trials] it is probable that there was only one engineer living who believed that the triple valve could be so altered as to stop a 50-car train at 40 miles an hour on a 53-ft. grade in less than half the length of the train without a shock or even the smallest movement of the slidometer. . . . We have long regarded the eminent services of Mr. Westinghouse to the railroads as sufficient to place him on a level with the foremost of those who have benefited the world by mechanical inventions; and we now offer him our hearty congratulations on this new and important achievement whereby the necessity or even the desirability of an electric complication of the air-brake is completely avoided."

It has seemed important, or at least interesting, to recall this historical episode in the development of the air-brake. Really, when it is carefully considered, it covers pretty well the question raised by Mr. Bignell. It was ascertained then that with the plain triple the shocks and the break-in-twos were intolerable, and these troubles are *inherent in the construction of the plain triple valve.* A very long train cannot be handled with the plain triple except by the constant exercise of care and skill. On the other hand, a very long train, *completely* fitted with the quick action triple can be handled, in emergency stops, and in service stops, with practical freedom from dangerous shocks. This presupposes the complete equipment of the train, and most of the valves (not necessarily all of them) in operative order. In other words, with the quick-action triple, safe and comfortable handling of long trains is a result that may be easily realized under working conditions; with the plain triple it cannot be realized, and in the nature of the apparatus never can be.

Mr. Bignell's specific complaint is that the quick-action valve goes into emergency action sometimes when the engineman does not intend that it should—a mode of action which is very conveniently summed up by the word involuntary. The damage done by such an emergency application on a train consisting partly of cars with no air-brakes whatever may be somewhat greater with quick-action valves than it would be if the air-braked cars had plain triples. The very virtues of the quick action triple valve become

evils when it is not properly used. But when freight trains are completely fitted, this class of troubles disappears, by virtue of the quick action feature.

Further, this involuntary quick action is, in great degree, due to the presence in trains of a valve of inferior design and construction. This unfortunate situation will correct itself with the growth of intelligence among those who are now responsible for its existence. That process may, however, be somewhat slow.

To sum up, the troubles of which Mr. Bignell writes would only be intensified by a return to the plain triple; they will be cured by the use of more quick-action triples. But these must be correct in principle, properly made, and cared for just as all other good machinery must be cared for. Such is our estimate of the situation; in stating it thus we have no desire to shut off discussion.

April Accidents.

We publish in another column of this issue a condensed record of the principal train accidents which occurred in the United States in the month of April. The record contains accounts of 24 collisions, 30 derailments and 4 other accidents. Those which were most serious, or are of special interest by reason of their causes or attending circumstances occurred as follows:

6th, Milletts, Mich.
14th, Glendive, Mont.
25th, Haskell's, Ind.
26th, Port Perry, Pa.
27th, Kalamazoo, Mich.
27th, Wallen, Ind.
28th, Dover, N. J.
29th, Cama, Mo.
30th, Sparrow Bush, N. Y.

Only two of these accidents, Milletts and Cama, were attended with fatal results to passengers. The cause of the derailment at Cama appears to have been undiscovered. Some of the other accidents in this list are notable for their remarkable freedom from personal casualties, rather than for their severity.

Two of the accidents in the present record, those on the Great Northern, April 7 and April 8, appear to have both occurred to the same train; that is to say, through train No. 4, eastbound. The two accidents occurred at places about 440 miles apart, and the train that was derailed at Belton, was, of course, one which was made up after the wreck of the original No. 4 at Winchester.

The number of electric car accidents reported in the newspapers for April was seven, and the casualties aggregated two killed and 26 injured. One of these accidents, at Joliet, April 8, is included in the train-accident record, as a passenger car was knocked off the track. The most serious electric car accident was one near Waterford, N. Y., a butting collision, where one of the motormen is said to have forgotten a meeting order.

The Railroads of the World.

The following table is compiled, reduced and converted to English units, from the tables published in the May-June issue of the *Archiv für Eisenbahnwesen*:

The Railroads of the World at the End of 1900.

Country.	Miles in 1900.	Per cent. of Increase, 1896-1900.	Per mile of R. R. Inhabitants.	Per mile of R. R. Square miles.
EUROPE:				
German Empire	31,933	8.5	1,701	6.52
Austria-Hungary (including Bosnia and Herzogovinia)	22,917	14.6	2,051	11.39
Great Britain and Ireland	21,864	2.8	1,889	5.53
France	26,611	4.6	1,451	7.78
Russia (including Finland)	29,892	24.6	3,556	68.32
Italy	9,810	2.2	3,307	11.28
Belgium	3,943	9.8	1,711	2.89
Netherlands (with Luxemburg)	1,994	2.5	2,678	6.89
Switzerland	2,351	6.2	1,415	6.79
Spain	8,300	3.8	2,138	23.11
Portugal	1,476	0.8	3,581	24.22
Denmark	1,865	30.0	1,312	7.95
Norway	1,286	5.9	1,735	96.96
Sweden	7,034	14.4	725	24.73
Servia	359	1.4	6,947	51.54
Roumania	1,925	7.5	3,072	26.27
Greece	605	2.1	4,023	41.02
Turkey in Europe (with Bulgaria and Roumelia)	1,952	29.3	5,030	52.80
Malta, Jersey, Isle of Man	68	0.	5,353	6.25
Total Europe	176,174	10.1	2,215	21.18
NORTH AMERICA:				
United States	193,304	5.8	383	15.48
British North America	17,831	9.6	294	189.85
Newfoundland	641	37.4	324	66.74
Mexico	9,055	19.9	1,394	84.73
Central America (Guatemala, Honduras, Nicaragua and Costa Rica)	718	13.9	3,313	230.32
Total North America	221,549	6.6	427	33.19
SOUTH AMERICA:				
Colombia	400	13.9	11,250	1,284.55
Cuba	1,134	2.6	1,439	40.44
Venezuela	634	0.	3,856	635.74
San Domingo	117	0.	4,308	160.39
Brazil	9,195	13.6	1,845	351.09
Argentine Republic	10,171	13.2	471	109.53
Paraguay	157	0.	3,197	621.89
Uruguay	1,144	14.7	723	60.31
Chili	2,850	13.7	1,053	105.13
Peru	1,036	0.	2,876	420.05
Bolivia	621	0.	3,934	829.73
Ecuador	186	0.	6,473	621.58
British Guiana	55	151.4	5,055	1,616.90
Jamaica, Barbadoes, Trinidad, Martinique, Puerto Rico, Salvador	657	25.7	.....	.....
Total South America and West Indies	28,357	11.9	.....	.....
ASIA:				
British India	23,758	17.8	12,231	82.36
Ceylon	297	0.	11,232	95.51
Asia Minor and Syria	1,715	41.6	9,025	400.31
Russia (Trans-Caspia)	1,658	76.4	422	129.22
Siberia and Manchuria	3,852	104.1	1,499	1,242.28
Persia	34	0.	264,706	18,693.18
Dutch India (Java and Sumatra)	1,301	0.6	20,885	177.74
Japan	3,661	59.8	12,713	33.58
Portuguese India	51	0.	10,800	24.34
Malay States (Borneo, Celebes, etc.)	273	69.5	2,633	121.92
China	401	48.8	890,900	10,665.06
Korea	26	....	400,000	8,400.
Siam	203	127.1	44,335	1,203.42
French India (Cochin China, Pondicherry, Malacca and Tong-King)	238	3.0	.....	.....
Total Asia	37,469	29.5	.....	.....
AFRICA:				
Egypt	2,087	44.3	4,671	183.96
Algeria and Tunis	2,642	3.4	2,413	131.14
British South and Central Africa	2,937	....	601	103.43
Natal	737	....	1,056	3,714.
South African Republic	1,203	....	721	99.03
Orange Free State	597	....	348	84.80
Mauritius, Reunion, Gold Coast, Lagos, Congo, Angola, German S. W. Africa, Mozambique, German E. Africa, Somali, Erithrea	2,298	....	.....	.....
Total Africa	12,501	35.7	.....	.....
AUSTRALASIA:				
New Zealand	2,280	4.0	326	45.89
Victoria	3,217	3.1	366	27.48
New South Wales	2,810	7.4	480	109.66
South Australia	1,882	0.7	192	604.44
Queensland	2,800	17.4	173	238.74
Tasmania	479	0.9	371	54.71
West Australia	1,363	18.3	123	715.95
Hawaiian Islands	88	24.6	1,238	77.63
Total Australasia	14,922	7.5	306	206.60
RECAPITULATION:				
Europe	176,174	10.1	2,215	21.18
North America	221,549	6.6	427	33.19
South America	28,357	11.9	.....	.....
Asia	37,469	29.5	.....	.....
Africa	12,501	35.7	.....	.....
Australasia	14,922	7.5	306	206.60
Total the World	490,960	10.3	.....	.....

Train Accidents in the United States in April.‡

(*Continued from page 397.*)

xc, 12th, Illinois Central, Memphis, Tenn., a northbound passenger train ran into a switching engine in the yard; fireman killed and three other trainmen injured, one of them fatally. It is said that the passenger train was 30 minutes late, and that the enginemen of the switching engine occupied the main track assuming that the passenger train had passed.

unf, 13th, Gulf, Colorado & Santa Fe, Brownwood, Texas, a freight train drawn by two engines was derailed by a sleeper which had been washed on to the track by a flood, and 20 cars were ditched. One engineman was fatally scalded and two other trainmen were injured.

unx, 13th, Chesapeake & Ohio, Springwood, Va., a freight train was derailed and 18 cars of coal fell down a bank.

*unf, 14th, Northern Pacific, Glendive, Mont., a passenger train was derailed at a trestle bridge which had been weakened by fire. The mail car was overturned and six other cars were badly damaged. The mail car and the express car took fire, and were partly burned up. The mail agent was injured.

rc, 15th, Kansas City Southern, Texarkana, Texas, rear collision of freight trains. Two trainmen fatally injured.

xc, 15th, 8 p.m., Erie road, Buffalo, N. Y., collision of locomotives, due to a misplaced switch; one fireman killed, one engineman injured.

dn, 15th, 9 p.m., Central of New Jersey, Bayonne, N. J., three cars broke away from the rear of a freight train and ran back down grade some distance to the draw in the Newark Bay bridge, where they fell into the water. Brakeman Thomas Long, who tried to stop the cars, was drowned.

unx, 15th, Great Northern, Chattaroy, Wash., eastbound passenger train, No. 4, was derailed, and three baggage cars and one passenger car were overturned. One passenger was seriously injured and several other persons slightly.

xc, 17th, 9 p.m., New York, New Haven & Hartford, Ansonia, Conn., collision between a freight train and a switching freight; two trainmen killed. An Italian brakeman of the switching train, who is said to have neglected to signal the freight, was arrested immediately after the collision.

*rc, 18th, Baltimore & Ohio, Newark, Ohio, rear collision of freight trains, wrecking one engine and many cars. The wreck took fire and was partly burned up. Engineman killed, conductor injured.

eq, 18th, Pennsylvania road, Charleroi, Pa., passenger train No. 10 was derailed and five passengers and one trainman were injured. It is believed that the derailment was due to a brake-shoe becoming loose and falling on the track.

*rc, 19th, Illinois Central, Mounds, Ill., a freight train which had been unexpectedly stopped was run into at the rear by a following freight, and the caboose was wrecked. The flagman of the train, inside the caboose, was killed, and his body was burned up in a fire which broke out and consumed the caboose. It appears that the conductor, after notifying the flagman to go back with a red signal, went forward to ascertain the cause of the detention of his train; the flagman appears to have fallen asleep in the caboose.

bc, 19th, Wheeling & Lake Erie, Navarre, Ohio, butting collision of freight trains, wrecking both engines and 15 cars.

dn, 19th, 2 a.m., Southern Pacific, Fresno, Cal., a northbound passenger train was derailed at the derailing switch approaching the crossing of the Santa Fe road.

xc, 20th, Pennsylvania road, Covert, Pa., passenger train No. 219 collided with a work train, and both engines and the baggage car were wrecked. The passenger engineman was killed, and two other employees were injured.

*unf, 20th, Cleveland, Akron & Columbus, Sunbury, Ohio, a freight train broke through a trestle bridge which had been weakened by fire, and the engine and 12 cars fell about 50 ft. to the creek below. There was a dense fog at the time. The trainmen jumped off and escaped with slight injuries. The wrecked cars and most of the bridge were burned up.

bc, 21st, Blue Ridge Ry., Anderson, S. C., collision between a passenger train and a switching engine; three employees injured.

dn, 21st, Lake Shore & Michigan Southern, Ashtabula, Ohio, a freight train ran into an open drawbridge and the engine and six cars fell into the water. The fireman was killed and the engineman injured.

unx, 22nd, 3 a.m., Cincinnati, Hamilton & Dayton, Washington C. H., Ohio, a freight train was derailed and 13 cars were wrecked.

On the afternoon of the same day a train, consisting of an engine, a caboose and one freight car, going to this wreck, was struck by a high wind and the roof of the freight car was blown off, together with three men who were riding upon it. The men were badly injured.

rc, 23rd, Pittsburgh, Fort Wayne & Chicago, Beaver Falls, Pa., rear collision of freight trains, wrecking three cars. The engineman jumped off and was killed.

xc, 23rd, Brownwood, Texas, a freight train of the St. Louis & San Francisco ran into a freight of the Atchison, Topeka & Santa Fe at the junction of the two roads, wrecking several cars. Three trainmen were injured.

unx, 24th, 4 a.m., Bessemer & Lake Erie, near Culmerville, Pa., the engine of a freight train was derailed near a trestle bridge, and the engine and 12 cars fell, with a part of the bridge, to the creek below. The engine remained on top of the 80 ft. girders of the bridge, but the cars, which were loaded with ore, fell into the creek.

bc, 24th, Southern Pacific, Summit, Cal., butting collision of freight trains in a snow-shed; both engines were badly damaged and a long section of the shed was broken down. Both firemen were injured.

xc, 24th, East Swanton, Vt., passenger train No. 2 of the Central Vermont ran into passenger train No. 7 of the St. Johnsbury & Lake Champlain, at the crossing of the two roads, wrecking one passenger car. Three passengers were injured.

xc, 24th, Boston Corners, N. Y., a passenger train of the New York Central & Hudson River ran into a freight of the Central New England, at the crossing of the two roads, badly damaging the passenger engine and several freight cars, and derailing the whole of the passenger train.

unx, 24th, Missouri Pacific, Warrensburg, Mo., a freight train was derailed while running at good speed, and several cars were ditched. Two brakemen were injured.

xc, 25th, 11 p.m., Grand Trunk, Haskell's, Ind., a passenger train collided with a freight car which had been blown out from a side track by a high wind, and the whole train was ditched. The engine was overturned and the engineman and fireman were badly injured. Two other trainmen and several passengers were also injured.

26th, Cincinnati, New Orleans & Texas Pacific, Ridge Fork, Tenn., a freight train was derailed by the loosening of the rails of a bridge in consequence of the burning of some of the sleepers. Ten cars ran some distance along the bridge after they jumped the track. The fireman jumped off and was killed.

unf, 26th, Baltimore & Ohio, Port Perry, Pa., passenger train No. 49 was derailed by the roof of a freight car which was blown upon the track a few seconds before the passenger train came along, and the engine was overturned. The baggage car, and other parts of the wreck, fell against the freight train (from which the roof had been blown) and several cars of the freight train were derailed. The passenger engine was wrecked and the fireman was fatally scalded. Three other trainmen were injured.

unx, 26th, Plant System, Mascotte, Fla., a mixed train was derailed and two freight cars, a mail car and a passenger car were overturned. Six persons were injured.

*xc, 27th, Lake Shore & Michigan Southern, Kalamazoo, Mich., a freight train descending a grade broke in two, and the rear portion afterward ran into the forward one, wrecking 20 cars and damaging a number of others. An oil car exploded and the explosion set fire to the wreck. About half of the wrecked cars, with a number standing on a side track, were destroyed, and a carriage factory was considerably damaged by the fire. An unknown man was killed.

xc, 27th, 11 p.m., Grand Rapids & Indiana, Wallen, Ind., collision between an excursion train and a freight; two passenger cars overturned, and five passengers and three trainmen injured.

unx, 28th, St. Louis & North Arkansas, Hot Springs, Ark., the caboose of a freight train was derailed and overturned, and 10 passengers and employees riding in it were injured.

o, 28th, Delaware, Lackawanna & Western, Dover, N. J., the locomotive of a passenger train was wrecked by the explosion of its boiler, and the two passenger cars next behind the engine were derailed and overturned. The engineman and fireman were killed and a few passengers were slightly injured.

‡unx, 29th, Atchison, Topeka & Santa Fe, Cama, Mo., eastbound passenger train No. 4 was derailed and the whole train, except the engine, fell down a bank. Three of the six cars rolled over completely. Two passengers and two trainmen were killed and 23 passengers were injured.

unx, 30th, Minneapolis, St. Paul & S. S. M., Camden Place, Minn., a freight train was derailed and the engine and seven cars were wrecked. The engineman was killed. The derailment occurred at a switch.

o, 30th, Cincinnati, Hamilton & Dayton, Whitfield, Ohio, the locomotive of a freight train was wrecked by the explosion of its boiler, and several freight cars were badly damaged. The engineman was killed.

*30th, 10 p.m., Erie Road, Sparrow Bush, N. Y., a freight train was derailed and 14 cars were wrecked. Eight of the cars contained oil in which fire broke out, and the eight tanks exploded. Several cars of merchandise were burned up, and also a barn near the track; both tracks were blocked five hours.

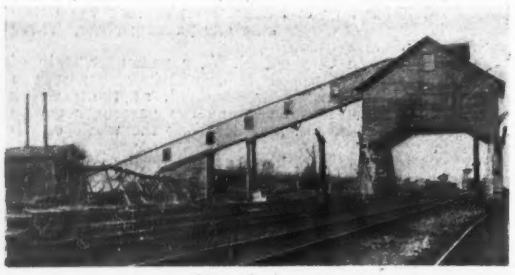
Chicago Railroads Sued for Valuable Land.

In a previous issue (February 28) reference was made to a legal controversy between the Pennsylvania Lines and the Trustees of the Sanitary District of Chicago over certain lands lying along the Chicago River and at present occupied by tracks, docks and freight houses belonging to the railroad. Suit has been begun by the Attorney General of Illinois, on a bill prepared by counsel for the Sanitary Trustees, to recover from the Pennsylvania and tenant companies, land lying along the west river front from Adams to Van Buren street, and having an average width of 95 ft. The bill alleges that the

defendants have been gradually encroaching on the river from the west side since 1873, by filling in with ashes, earth and rock, and that the original channel has been reduced in this manner by 95 ft. It is demanded that the defendant railroad companies restore the river to its original width of 195 ft. In case the suit succeeds this will mean that not only must all claims to the river frontage be relinquished by the railroads, but that the "made" land must be cleared away by the present occupants. The tenant companies referred to above are the Chicago & Alton, Chicago, Burlington & Quincy, and the Chicago, Milwaukee & St. Paul, all of which have tracks, docks and buildings on the land involved; the Adams Express Co. also has a depot on the property and is named as a defendant. The bill places the value of the land at $200,000, but other estimates run as high as $1,000,000. The railroads are expected to contest the suit vigorously.

Robins Belt Conveyors in a Coaling Station.

The engraving from a photograph, taken at Groveland, N. Y., shows one of the new locomotive coaling stations of the Delaware, Lackawanna & Western where coal is handled by Robins belt conveyors. The coal cars come in on a siding at the foot of the incline and discharge into a hopper underneath the track. In the bottom of this hopper is a grizzly, which screens out all



lumps of coal larger than 8 in., the smaller coal passing through to the belt conveyor. The large lumps are broken with sledges on the grizzly bars and fall through to the conveyor. By this means a crusher is avoided.

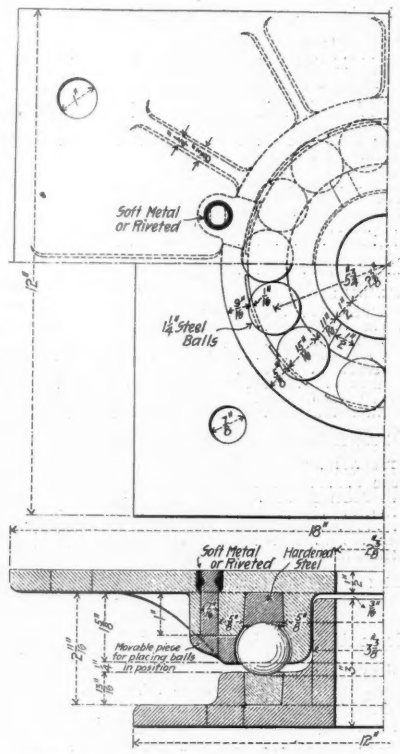
A 24 in. Robins belt conveyor, 151 ft. long, running at an angle of 18 deg., carries the coal to a 500-ton storage bin, carried by two concrete piers, over two tracks. The storage pocket is hopper bottom and the coal is distributed from the inclined conveyor through the bin by a second 24 in. conveyor with an automatic tripper. This automatic tripper travels back and forth the entire length of the bin, giving an even distribution of the material. Coal can be drawn from the hopper into the locomotive tenders by gravity on any one of the four tracks. By this means, coal can be put in storage as fast as cars can be drawn over the track hopper.

Five hundred tons, the capacity of the plant, is easily handled in from three to four hours, and at an actual cost of 1¼ cents a ton, which cost includes the interest on the amount invested in the plant, and the depreciation in the value thereof, as well as the cost of power used to drive the conveyors and all labor necessary to operate them.

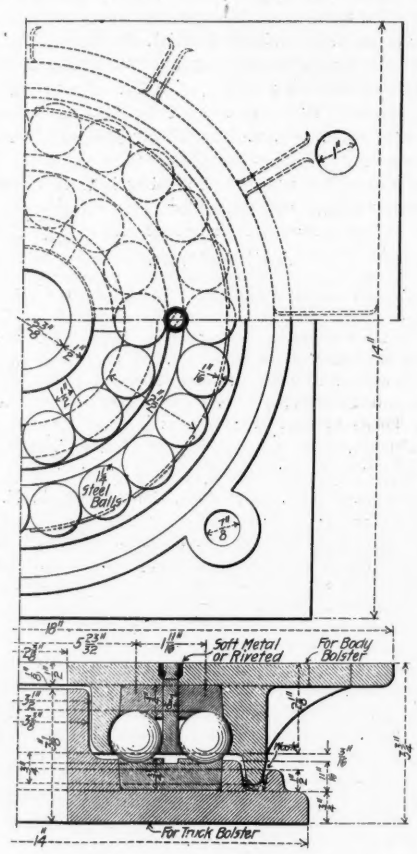
The Norwood Ball Bearings for Center Plates and Side Bearings.

In dealing with the car center plate question, it used sometimes to be argued that the motion of the plates, one upon another, when a car goes round a curve, was so small that the wear caused thereby might be neglected. For easy curves, and the light cars and light loads of former days, the effect of wear may not have been so apparent as it is to-day. The Baltimore Ball Bearing Company point to the inevitable results of the long continued, slow-grinding action of center plates put together so that the under plate becomes a dust and grit collector, while the heavy car and heavy load, now common, hold these plates so close in contact as to produce immense frictional resistance to motion. This being the case, it follows that when a heavily loaded car, of ordinary center plate and side-bearing construction, strikes a curve, the trucks are slewed, and the flanges of the leading wheels in each truck bear hard against the outer rail. This state of affairs is unavoidable while a car is on a curve, but when it again goes on a tangent, the friction between plate and plate and between side-bearing and side-bearing, is so great that it is hard for the slewed truck to return to its normal position, and it goes on, possibly for miles, on a straight track grinding away flanges and rails and giving the engine more work to do. The Baltimore Ball Bearing Company believes that this accounts for a great deal of the flange wear and failure which has taken place under the very heavy equipment, which has been put in service during recent years. With ball-bearings, the truck is not held in any one position but turns back freely to normal position.

The object in designing the ball-bearing center plate and side-bearings, was not in any way to ignore positive, though slight movement, or to disregard very small daily



Single Ball-Race Center Plate.



Double Ball-Race Center Plate.

wear, but to look squarely at the effects of each, in the aggregate, and to adequately provide for them, just as the side rod of a locomotive, which connects three or more wheels, is jointed in order to allow for minute but positive movement.

The center plates themselves are fitted with single or double ball-races. The plates are made of cast-steel and contain wear strips of drop forged steel, carefully case-hardened. The metal about the king-pin in the lower plate extends up about 1½-in. into a recess in the top plate, so that in case of violent shock, the balls cannot be unseated. A movable piece is placed in the outer wall of the single ball race, so that the balls, which are hung in the upper plate, may be removed. The illustration shows this piece secured by a small stem, around the head of which soft metal has been poured and riveted. In later designs this piece has a lug and stud, and can be withdrawn without taking down the top center plate. In the double race plates, the circular wall dividing the balls is secured to the top plate by pins with heads bedded in soft metal and riveted. Later designs have this ring screwed up from below, so that the balls can be liberated without removing the top plate. The object of hanging the balls in the top plate is to keep them as free as possible from dust and grit.

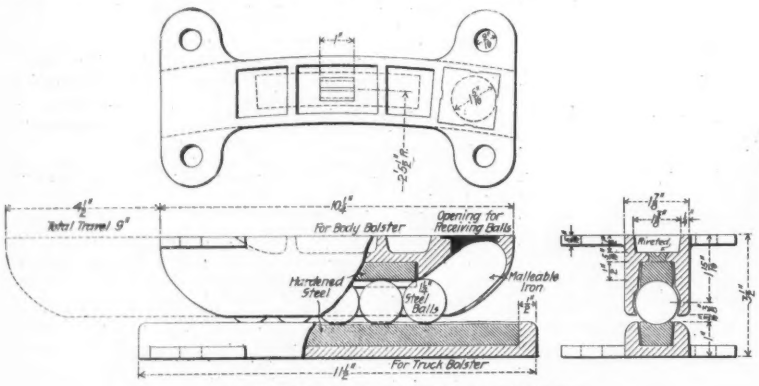
The balls themselves appear to be practically indestructible. They are of tool steel ground and tempered. Mr. J. E. Norwood, the superintendent of the company, informs us that he endeavored to crush some of them under a steam hammer, but only succeeded in driving them through a thick plate of cold steel.

In the center and side-bearings with double ball-races, the wearing strips for both sets of balls is made in one piece, and is rounded off on the two lower corners. It lies in a recess with fillets cast where side walls and floor join. This form of construction allows for the adjustment of the wear strips, under load, so that an even amount of weight is carried on both rings of balls. The upper double ball-race center plate is provided with a lip which fits loosely into a groove in the bottom plate. This circular recess when filled with waste makes an excellent dust guard.

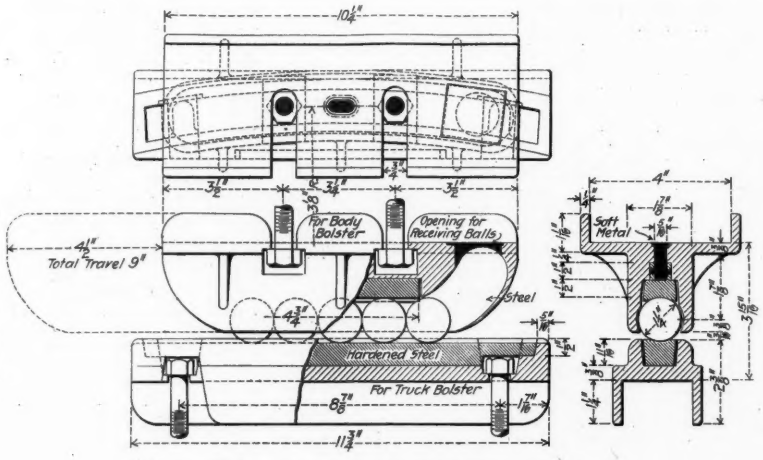
One advantage which is claimed for these center plates and side-bearings beyond those already mentioned, is that as all the balls rest upon shallow grooves in the wear strips, slight side or end motion is possible, but the tendency of the bolster is continually to come back to its proper place. The superiority of balls over rollers in this respect is relied upon by the company to give satisfactory results in practice.

The endeavor is to carry more weight on the side-bearings than on the center plates, and this is possible on account of the great reduction of friction, by using balls. An incidental advantage of such an arrangement is that the weight is transmitted from member to member in a more direct line, and the truck bolster may be somewhat reduced in weight.

The side-bearings are similar in principle to the center-plates. They permit of a total swing of 9½ in. The



Ball Side Bearing for Wooden Bolsters.



Ball Side Bearing for Metal Bolsters.

balls being suspended in the upper bearing, only encounter the dust which may sift in between the bearings, but the action of the balls tends to keep the lower wear strip clear, as the grit is worked out over the ends. The top suspension permits of a long under wear strip and a minimum number of balls. In extreme position one ball in each bearing has gone out of service and is forced up into the receiving cavity, down which it rolls into place by gravity when the bolster again assumes the central position.

A very satisfactory use of ball-bearings for center and side plates can be had by using a cast-steel bolster, in which the center plate and side bearings are part of the casting. In this arrangement the only separate parts are the wear strips and the balls. These would be separate parts in any form of construction. The combining of the

center plate and side-bearings in bolsters reduces the number parts, and this usually means reduction of first cost and always means reduction of maintenance charges. The claim is made that the bolster can thus be reduced in weight about 18 per cent. To equalize the distribution of weight, a liner of any desired thickness may be placed below the wear strip in the lower permanent center plate.

TECHNICAL.

Manufacturing and Business.

The Pittsburgh Blue Print Co. received orders aggregating 50,000 yds. of "Rapid" Printing blue print paper, during the month of May.

The Cleveland Pneumatic Tool Co. has appointed the Compressed Air Machinery Co., of San Francisco, Cal., to represent it on the Pacific Coast.

Charles F. Quincy, President of the Railroad Supply Co., Chicago, resigned on May 19, and Henry S. Hawley has been elected President and Treasurer.

Pawling & Harnischfeger, Milwaukee, Wis., makers of electric traveling cranes and hoists, advise us that the condition of business remains unchanged and is entirely satisfactory.

The Handy Car Equipment Co., Old Colony Building, Chicago, has taken over the sale of the American Dust Guard, made and formerly sold by the American Dust Guard Co., Columbus, Ohio.

Hering & Fuller, Hydraulic Engineers and Sanitary Experts, announce the removal of their offices from the Woodbridge Building, 100 William street, to the Broadway-Maiden Lane Building, 170 Broadway, New York.

The Q & C Co., manufacturers of railroad specialties, machinery and pneumatic tools, will operate in their own name commencing June 1st, principal office Western Union Building, Chicago; New York office, 114-118 Liberty street, with their General Sales Department located at their shops, Chicago Heights, Ill.

The J. S. Toppan Co., Chicago, is inviting attention to a new automatic car door seal for which the following good points are claimed: Simplicity of construction and operation; no necessity for any tools on the part of the sealer; no balls or lead pipe in its makeup, as it is made entirely of one piece of tin; it cannot be opened without breaking; the time required for sealing a train is much reduced by its use.

The Boston & Montana Consolidated Copper & Silver Mining Co. is making considerable additions to the electrical equipment of its smelters and refineries at Great Falls, Mont., having recently purchased 11 15-h.p. and three 40-h.p. Westinghouse, 500-volt, shunt wound, direct-current motors. About four years ago this company installed a number of Westinghouse 180-volt, electrolytic generators, and at the same time put in a large number of motors for driving ventilating fans and other machinery about the smelters.

The Ajax Metal Company has recently acquired additional ground which will give a floor space of close to one acre. A building will be erected 100 x 175 ft. for the purpose of refining all kinds of brass scrap, under the patents of Mr. G. H. Clamer, to eliminate zinc, iron and other impurities, making the metal practically pure. The company will be in position to work the ores, such as copper matte and galena direct from the mines, and can produce a bearing metal which will cost considerably less than the market prices ruling to-day. The additional plant will be erected and in operation by September.

The C. A. Manufacturing Co., Austin, Texas, is general selling agent in the United States and Mexico for "C. A. Wood Preserver" (Carbolineum America), which is made in Mannheim, Germany. This wood preserver is a heavy dark brown oil stain which impregnates all kinds of wood without forming a coating or closing the pores. It is always ready for immediate use and may be applied with a brush, or the timber may be immersed in it. One gallon covers 150 sq. ft. of rough or 300 sq. ft. of dressed lumber. A small pamphlet issued by the company contains numerous testimonials certifying to the preservative qualities of the product.

The Industrial Water Company, 126 Liberty street, New York, announces that it has just received another order for a water softening and purifying machine from the Rio Grande & Eagle Pass Ry., to be installed at Laredo, Texas. A year ago that company bought its first machine, and since that time has been running, for the purpose of test, one locomotive on treated water exclusively, with the result that after thorough test of the apparatus it has placed the above mentioned order. At Matehuala, San Luis Potosi, Mexico, another railroad water softening machine, recently installed for the Ferrocarril Porvenir de Matehuala, is treating successfully a water containing more than 90 grains per U. S. gallon of calcium sulphate in addition to other scale-forming salts.

J. W. Duntley, President of the Chicago Pneumatic Tool Co., has just returned from a trip through Europe, where he secured orders for an aggregate of 2,700 Boyer and Little Giant pneumatic tools, as well as for 25 Franklin air-compressors, for early delivery. Mr. Duntley says that the Europeans now realize the necessity of using labor-saving tools to reduce the cost of manufacture and counteract the influence of the American invasion, which is causing widespread alarm. The great sales of pneumatic tools in foreign countries recently may be attributed, in a measure, to this cause and also to the fact that the opposition to pneumatic tools by workmen, on account of their labor-saving qualities, has been overcome. The various plants of the company are taxed to their utmost capacity and will have to be greatly enlarged.

Iron and Steel.

The Fargo Bridge & Iron Co., of Fargo, N. Dak., has just received contracts for 14 large steel bridges for Walsh County, that State.

Proposals for bids for furnishing 40 tons of bar iron for the Puget Sound Navy Yard will be opened at Washington, D. C., June 3.

E. E. Wood, Assistant Superintendent of the Homestead Steel Works, has resigned and is succeeded by Assistant Superintendent Edward Weisner.

A despatch from Puebla, Mexico, says that a concession has been obtained from the Mexican Government by some Americans who propose to build a steel plant near that city.

The Commonwealth Steel Co. has just finished the foundations for all of its buildings at St. Louis and steel is now on the ground for the power house and engine house. The plant will be in full operation by Oct. 1.

It is announced that on June 1 Edward Shearson, Comptroller of the United States Steel Corporation, will retire, to be succeeded by William Filbert, now Assistant Comptroller. Mr. Shearson has arranged to enter the Stock Exchange firm of Shearson, Campbell & Co.

John M. McConnell, General Superintendent of the steel plant of the Tennessee Coal & Iron R. R. Co. at Ensley, Ala., has resigned and is succeeded by S. McDonald, of Youngstown, Ohio. T. H. McNamee, Superintendent of the blooming mill; Harry Barth, Superintendent of the open-hearth furnaces, and John J. McNamee, Night Superintendent of the blooming mill; also John Jones, Master Mechanic, have resigned.

A New English Suburban Locomotive.

It is reported that a radically new design of suburban tank engine is being built from the designs of Mr. Holden, Locomotive Superintendent of the Great Eastern, at Stratford. The engine will have five pairs of wheels, 4 ft. 6 in. diameter, and three high-pressure cylinders, 18½ x 24 in. stroke (two outside the frames and one inside). The boiler will be 14 ft. 9 in. long, and 5 ft. 3 in. in diameter, with a total heating surface of 2,769 sq. ft. There will be 384 tubes, 1¾ in. diameter which will contribute 2,638 sq. ft. The fire-box will have a grate area of 36 sq. ft., while the side tanks will carry 2,000 gallons of water, and the end bunker 3½ tons of coal. The total wheel base is to be 19 ft. 8 in., and the weight in running order 60 tons. This engine is intended to obtain a high average speed over a line on which there are 14 intermediate stops in a distance of 10¾ miles, by means of quick acceleration, since it will be expected to start one of the ordinary trains from rest and attain a speed of 30 m.p.h. in 30 seconds.

The Bullock Electric Manufacturing Co.

In 1896 this company was known as the Card Electric Motor & Dynamo Co., and it employed 20 hands. To-day it employs 600 hands on night and day shifts, and, when the additions now in progress are completed, it will employ 1,200 hands. It has been running night and day forces since October, 1900. In 1897 the company was organized under the Ohio laws and with its present name, the officers being George Bullock, President and Treasurer; J. S. Neave, Vice-President, and J. Wilson Bullock, Secretary. In 1899 the capital stock was increased to $1,000,000, and three new buildings erected, namely, office, 100 ft. x 100; machine shop, 300 ft. x 101; power plant, 165 ft. x 50. In 1901 the company was reorganized under the New Jersey laws and the capital increased to $2,000,000. This year 200 ft. was added to the machine shop and the following buildings erected: Erecting building, 100 ft. x 60; storage room, 100 ft. x 60; stable, 45 ft. x 60. In this year Mr. S. R. Burton became Treasurer. The company is now building a machine shop, which, when completed, will be 177 ft. x 1,200. Also a pattern shop, transformer and insulation building, 50 ft. x 260. This new machine shop will be 52 ft. high under the main aisle crane hook and 30 ft. under the side aisle crane hooks. The product of this company is distributed all over the world; a number of the stations of the Siberian Railroad being lighted by the Bullock machines, and the company is now putting up dynamos and motors for mining in Tasmania. The largest generators now building are 38 ft. in diameter, with a capacity of 3,200 k.w.

The Isthmian Canal.

The U. S. Senate Committee on Isthmian Canals last week decided to report adversely Senator Hoar's bill, previously mentioned in this column, placing the selection of an interoceanic canal route in the hands of the President. The bill, it is said, was opposed by the advocates of the Nicaragua route.

"Safety Box" for Train Orders.

Mr. Ira G. Hoag, who is connected with the Southern Pacific at Los Angeles, has patented a box, to be interlocked with a train order-signal, for holding train-orders, the interlocking being so arranged that the operator cannot get hold of or use his blanks, for filling out train orders, until after he has put his train order signal in the stop position. The blanks, when in the box, are completely enclosed. Before the cover can be raised and the box opened, the lever controlling the out-door signal must be put in the stop position; and when the box cover is raised it locks the signal lever. The inside of the box is painted red.

Stone Ballast—Tie Timber—B. & A.

An officer of the Boston & Albany informs us that the main line of that road is to be ballasted with broken stone, and that 10 or 15 miles of the road will be thus treated this year. The company is planting 10,000 Catalpa trees at Westfield.

New York Rapid Transit Extension.

The Board of Rapid Transit Commissioners of New York City met on May 23 to consider the report of the sub-committee appointed to submit preliminary drafts for the final contract for the proposed Brooklyn tunnel. Briefly it is: Work must be finished within two years from the time of signing the contract; the contractor must lease the road for 50 years, with the privilege of 25 years renewal; he must state what connection with other railroads he can furnish; must state the maximum fare to be charged within the limit of 5 cents; must deposit $1,000,000 as security for the construction of the road, and a second $1,000,000 for the whole term of his lease to secure the performance of his obligation. The tunnel must have two tracks and trains must be run at an average speed of 14 miles an hour, including stops; night service is compulsory. The tunnel may be used for freight and express matter if passenger traffic is not interfered with. Upon the expiration of the lease the city may buy the contractor's equipment. There will be a public hearing on the contract on June 5.

Standard Steel Car Company.

Mr. Hansen, President of this company, has confirmed the report that W. L. Mellon and Henry Aiken have been elected directors of the company. It is understood that both these gentlemen will take active interest in the management.

American Steel Foundries.

The circular sent out by Harris, Gates & Co., syndicate managers for the proposed consolidation of the steel castings companies, shows it contemplates including the following: American Steel Castings Co. of New Jersey; Reliance Steel Castings Co., Ltd., of Pittsburgh, Pa.; Leighton & Howard Steel Co., of St. Louis, Mo.; Franklin Steel Casting Co., of Franklin, Pa.; the Sargent Co., of Chicago, Ill., and the American Steel Foundry Co., of St. Louis. The new concern is to be known as the American Steel Foundries, and is to have an authorized capital stock of $40,000,000, of which $20,000,000 is to be 7 per cent. cumulative preferred stock, and $20,000,000 common stock, of which $17,500,000 of preferred stock and $17,500,000 of common stock are to be issued at once.

Emergency Signals in the Erie Tunnel.

The electrical signaling arrangement, which was recently put up in the tunnel of the Erie Railroad at Jersey City, and which was briefly described in the *Railroad Gazette* Feb. 7, page 99, has been equipped with incandescent electric lights, the bulbs of which are red; and the tunnel watchmen are now enabled to give a stop signal to trains, in both directions, at short notice, in case of any obstruction of the track. The main signal wire, a metallic circuit from one end of the tunnel to the other, is normally closed; and the opening of this circuit at any point by a watchman, closes a bell circuit in the signal tower at the end of the tunnel. At the same time an electro-magnet closes a second metallic circuit, normally open, which lights up the red lights throughout the tunnel. The lights are fixed 50 ft. apart on each side, two separate circuits being used. The lights on the north side are staggered with those on the south, making the interval from light to light only 25 ft. The current is to be furnished by a storage battery of sufficient capacity to run 10 days or more. A few white lights in the signal tower will be run from this battery. The appearance of a red light, or light, at any point will be a signal to every train to stop at once.

THE SCRAP HEAP.

Notes.

A Washington (D. C.) newspaper says that the "Anti-Trust League" is going to proceed in the courts against the Eastern Railway Association, which association is declared to be an illegal combination in restraint of trade.

The number of regular trains entering and leaving the South station at Boston on week days, now aggregates 794 each day. This is believed to be the largest record of the kind in the United States.

The Appellate Division of the Supreme Court of New York, in a case against the Metropolitan Street Railway, has decided that the act of a passenger in getting on to a car which is in motion is not necessarily negligent or imprudent.

Traffic Notes.

The city of Galveston, Texas, now has a freight bureau.

Oregon papers state that the President of the Southern Pacific has promised to reduce passenger fares throughout the State of Oregon to the basis of three cents a mile. The present rate is four cents. Fares on the Oregon Railroad & Navigation Co.'s line have been three cents a mile for two years past.

Massachusetts papers say that the Boston & Albany, following an example which has been set by its lessee, the New York Central, at several places, will make radical reductions in fares between Boston and South Framingham, to meet the competition of electric street roads. South Framingham is 22 miles from Boston, and there are stations at very short intervals throughout this distance. The present fare is 50 cents. On the branch from South Framingham to Milford, 13 miles, the fare for many months has been only 10 cents.

The Railroad Commissioners of Texas are still considering the problems connected with their duties in relation to the recent law of that State requiring the establishment of interlocking signals at railroad cross-

ings. A meeting was recently held for conference with the managers and engineers of the principal roads of the State. The engineer of the commission recommends that interlocking be required at all crossings where there are 20 or more trains a day. This officer reports that since the commission began the investigation of this subject 100 gates have been demolished at railroad crossings by trains running into them.

Rensselaer Polytechnic Institute.

A number of important changes will be made in the Department of Physics and Electrical Engineering next year. The Chair of Electrical Engineering has been accepted by Prof. William L. Robb, Ph.D., who has been professor of physics and electricity in Trinity College. Professor Robb has had much practical experience as an electrical engineer. Beside general consulting engineering practice, he has for the last ten years been engineer of the Hartford Electric Light Company, and for the last three years consulting electrical engineer for the New York Ship Building Company. Very considerable additions to the equipment of the electrical department will be made under his direction before the beginning of the next year. A new addition will be made to the Chemical Laboratory Building in order to provide special laboratories for water analysis and special quantitative work. Dr. John M. Clarke, New York State Paleontologist, has accepted the Professorship of Geology and Mineralogy. He will still retain his position as State Paleontologist. The number of students this year is greater than ever before in the history of the school.

The Rochambeau Special Train.

The visitors from France who have come to this country to attend the unveiling of the statue of Count Rochambeau at Washington are visiting Niagara Falls, and other places, as well as the capital. The Pennsylvania Railroad has again been commissioned, as in the case of Prince Henry of Prussia, to conduct the special train throughout the whole of the visitors' journey. This train, which will be in charge of Mr. David N. Bell, consists of seven cars, all of the most elegant description. The railroad journeys are from Annapolis to Washington; Washington to Niagara Falls, by way of Baltimore, Harrisburg, Emporium and Buffalo; thence back over the Pennsylvania line to Harrisburg and thence by way of Philadelphia and Jersey City to West Point; to New York City on the government vessel "Dolphin"; then from New York to Newport, and thence to Boston, by rail all the way. The journey ends at Boston on May 30, and the "Gaulois," the French war vessel which brought most of the visitors, is scheduled to sail for home on June 1.

New Electric Service on the Clover Leaf.

Plans are now being arranged for an electric car service on the regular tracks of the Toledo, St. Louis & Western between Kokomo and Marion, Ohio, a distance of 27 miles. The company owns an electric plant in each of these cities and expects to operate cars, according to press reports, on an hourly or 30-minute schedule.

Troubles of an Ex-Railroader.

Temple, Tex., May 21.—To the Democrats of Texas: While I do not concede that the primaries held up to this time indicate my defeat in the contest for Railroad Commissioner, still I realize that the best I could hope for would be a locked convention. But being entirely out of campaign funds I deem it best to withdraw from the race. If the several counties had held primary elections on the same day, I could have made the campaign through to the end on less money than I have already expended. Having spent over half my life in railroad service the farmers and business men in small towns were suspicious that I was in league with the railroads, and to disabuse their minds of this false impression would have necessitated the organization of an army of canvassers; and the friends of my opponents were exerting every effort to keep alive that suspicion. Practically all of the railroad laborers were supporting me, and thousands believed that the railroad employees would not dare to support me if the corporations did not want them to do so. I regret very much that poverty compels my withdrawal. The loyal and enthusiastic support, financial and personal, which I have received from friends in all sections of our State is gratifying beyond measure. E. P. CURTIS.

Fortifications Appropriation Bill.

The U. S. Senate Committee on Appropriations has made additions to the Fortifications appropriation bill for the next fiscal year which bring the total up to $7,946,481, an increase of $1,384,481 over the amount carried by the bill as it passed the House of Representatives, and $582,470 more than last year's appropriation, but $11,060,717 less than called for by the estimates of the War Department.

Chair Car Service on the Schenectady Electric.

The Schenectady line between Albany and Schenectady, N. Y., is now running chair cars which seat 24 persons. These cars are 39 ft. long, fitted with rattan cushion seats which are movable, and are carpeted and tastefully fitted up. The extra charge for fare is 10 cents. The ordinary cars on this line are 45 ft. long.

LOCOMOTIVE BUILDING.

The Orange & Northwestern is having two locomotives built at the Manchester Works of the American Locomotive Co.

The Chesapeake & Ohio is having three locomotives built at the Schenectady Works of the American Locomotive Co.

The El Paso & Northeastern is having three locomotives built at the Manchester Works of the American Locomotive Co.

The Minneapolis, St. Paul & Sault Ste. Marie is having two locomotives built at the Cooke Works of the American Locomotive Co.

The Choctaw Construction Co. has ordered from F. M. Hicks one 50-ton freight engine rebuilt by the Hicks Locomotive & Car Works.

The Buffalo & Susquehanna has ordered from the Brooks Works of the American Locomotive Co., for delivery in August and in November, five simple consolidation locomotives, total weight, 163,000 lbs.; weight on drivers, 147,000 lbs.; cylinders, 20 x 28 in.; 51-in. drivers; radial stay boilers, with a working steam pressure of 200 lbs., and 304 charcoal iron tubes, 13 ft. 6 in. x 2 in.; dimensions of fire-box, 102 x 74 in. of carbon steel; tank capacity for water, 6,000 gal.; coal capacity, 10 tons. The special equipment includes Sterlingworth brake-beams, Brooks brake-shoes, Janney couplers, 18-in. circular-case Star headlights, No. 9 Hancock composite, double-delivery injectors; United States piston rod packings, Crosby safety valves, Leach sanding devices, Detroit tippet attachment, sight feed lubricators, French springs and Ashcroft gages.

CAR BUILDING.

The Rutland is having 26 coaches built at the Pullman Works.

The Iowa Central is having four parlor cars built at the Pullman Works.

The Boston & Maine order printed in our issue of May 2 was incorrect.

The Iowa & St. Louis is having two coaches built at the Barney & Smith Works.

The Bessemer Coke Co. is having 30 freight cars built at the Laconia Car Works.

The Missouri Pacific has ordered 30 coaches from the American Car & Foundry Co.

Wells, Fargo & Co. have ordered 10 cars from the American Car & Foundry Co.

The Baltimore & Ohio has ordered three dining and cafe cars from the Pullman Co.

The Choctaw Construction Co. has ordered from F. M. Hicks 10 box cars of 50,000 lbs. capacity.

The Vera Cruz & Pacific has ordered four third-class coaches from the American Car & Foundry Co.

The Pittsburgh Coal Co. is having 200 freights built at the Pressed Steel Car Co., McKees Rocks, Pa.

The American Car & Foundry Co. has orders from various parties for 33 cars of miscellaneous types.

The Winifrede R. R. (West Virginia) has ordered 30 coal cars from the American Car & Foundry Co.

The Cincinnati, Richmond & Muncie has ordered from F. M. Hicks two combination coaches rebuilt at the Hicks Locomotive & Car Works.

The St. Louis & San Francisco has ordered six postal cars and three combination baggage and mail cars from the American Car & Foundry Co.

The Lake Erie & Detroit River has purchased from F. M. Hicks 40 flat cars of 60,000 lbs. capacity, rebuilt by the Hicks Locomotive & Car Works.

The Cincinnati, New Orleans & Texas Pacific has placed an order for from 900 to 1,200 miscellaneous flat, box and coal cars, in abeyance, pending the return of the General Manager.

The Denver & Northwestern has ordered 30 dump cars from the American Car & Foundry Co. The Denver & Northwestern is the successor of the Denver, Boulder & Northern, and was incorporated in June, 1901, by Samuel M. Perry, Chas. J. Hughes, Jr., and others. It is projected from Denver, Colo., by way of Boulder and Greeley to the mouth of Platte Canyon.

The Ingoldsby Automatic Car Co. has received an order for 500 of their dumping coke cars of 82,000 lbs. capacity, to be built of steel by the Structural Steel Co., of Canton, Ohio. Also from the new Union Sand Co., of St. Louis, for 10 10,000 lbs. capacity steel dump cars, and from the Texas Short Line for three 100,000 lbs. capacity steel dump cars. All of these are to be built by the Structural Steel Co.

The Plant System has ordered 120 flat and 100 phosphate cars from the Georgia Car & Mfg. Co., delivery to commence in May, 1902, at the rate of 20 cars per day. These cars will be of 60,000 lbs. capacity; weight, flat cars, 26,000 lbs.; phosphate cars, 33,000 lbs.; length, flat cars, 40 ft. 8 in.; phosphate cars, 34 ft. 8 in.; width, flat cars, 9 ft.; phosphate cars, 8 ft. 6 in.; height of phosphate cars, 7 ft. 2 in. These cars are built of wood with wood underframes and cast-steel body bolsters. Special equipment includes Thornburgh single spring coupler attachments, mild steel axles, cast-steel bolsters, Westinghouse brakes, Ajax brasses, white wood dust guards, M. C. B. gray iron journal boxes, Morris sheet steel journal box lids, French springs, Diamond trucks and Decatur wheels.

BRIDGE BUILDING.

Akron, Ohio.—The Osborn Engineering Co. has made plans for a new bridge over Little Cuyahoga River at Prune street. Bids will be wanted in the near future.

Anoka, Minn.—Plans are being made by the County Surveyor for a steel bridge to replace the Faherty bridge.

Austin, Texas.—The County Commissioners Court is considering building a new bridge over Union Creek at Moore's crossing.

Berlin, Ont.—Tenders are being received by Henry J. Bowman, County Clerk, for a 136 ft. steel bridge with stone or concrete abutments, to be erected at New Hamburg, Ont.

Brownstown, Ind.—Bids are wanted June 6 for six steel bridges, including masonry. A. H. Manuel, County Auditor.

Buffalo, N. Y.—It is probable that bids will soon be wanted for the following bridges: Sprenger avenue over Scagaquada Creek to cost $3,000; South Park avenue over Cazenovia Creek, $12,000. Plans will soon be made.

Carthage, Mo.—The County Court is considering building some new bridges about nine miles northeast of Carthage.

Cass Lake, Minn.—It is said that a viaduct will be built in the near future over the tracks of the Eastern Minnesota R. R.

Chester, Pa.—Local reports state that the city has decided to build the Seventh street bridge, which is to cost about $7,500. The Philadelphia, Wilmington & Baltimore agrees to furnish the plans.

Crookston, Minn.—The bids received on May 13 for the highway bridge at Main street are rejected.

Doylestown, Pa.—The Doylestown & Easton Trolley Co. will join with the County Commissioners in building a temporary bridge until the bridge at Durham furnace, on the River road, can be built.

Dunkirk, N. Y.—Plans and specifications are made for a stone arch bridge on Prospect avenue. H. A. Holstein, Assistant City Engineer.

Fort Madison, Iowa.—Bids are wanted June 3 by H. J. Schroeder, County Auditor, for some bridges.

Fredericton, N. B.—Bids are asked by the Department of Public Works for the rebuilding of McCain's bridge and Buckweat bridge, in Carleton county.

Grand Rapids, Mich.—The contract for the steel bridge over the Grand River at North Park for the Grand Rapids Ry. has been let to the Wisconsin Bridge Co. (May 2, p. 334).

Harrisville, R. I.—Plans have been made by Henry J. Bruce, according to report, for a stone arch bridge at this place.

Hurt, Va.—Bids are wanted June 11 for a steel bridge over Staunton River at Hurt. J. B. Stone, Commissioner.

Iowa.—In the House of Representatives on May 23 a bill was introduced authorizing the construction of a pontoon bridge across the Missouri River in Cass County, Neb., and Mills County, Iowa.

London, Ohio.—Bids are wanted until June 18 by the County Auditor for two bridges, one over Oak Run and the other over Deer Creek.

McKeesport, Pa.—The city has appropriated $7,000 as half of the cost for the proposed bridge over White's Hollow from Versailles avenue.

Mahanoy City, Pa.—A committee of the Council has been authorized to advertise for bids for building a stone bridge at D street.

Manitowoc, Wis.—The City Council is considering the advisability of having a viaduct built over the tracks of the Chicago & North Western at Thirty-third street.

Middleborn, W. Va.—Bids are wanted June 13 by Hiram Underwood for a steel bridge 241 ft. long over Middle Island Creek.

Milwaukee, Wis.—According to local reports, bids will soon be wanted on the new bridge at Muskego avenue. A bond issue of $85,000 has been authorized for this purpose.

Newark, N. J.—Local papers state that the Central R. R. of New Jersey will build a lift bridge of one span over Newark Bay.

New Castle, Pa.—Despatches say that J. A. Atwood, Chief Engineer of the Pittsburgh & Lake Erie, is about to begin plans for a large viaduct over Gardner avenue and the Shenango River.

North Adams, Mass.—Bids are wanted until June 3 for a bridge known as First bridge.

Olivet, S. Dak.—D. D. Wipf, County Auditor, is receiving bids until June 11 for two steel bridges.

Pembroke, Ont.—Tenders will be received by S. E. Mitchell, County Clerk, up to June 18, 1902, for a steel bridge with stone abutments over the Bonnechere River at the village of Eganville, according to plans and specifications made by James Q. Morris.

Piqua, Ohio.—The Western Ohio Ry. Co. has been granted permission by the County Commissioners to build a viaduct 100 ft. long at this place.

Pittsburgh, Pa.—According to local report the Pennsylvania R. R. will enter the lower end of Herrs Island by a steel bridge. A temporary wooden bridge will be built for the present.

Port Angeles, Wash.—Bids are wanted June 9 by Frank Sullivan for two bridges.

Pueblo, Colo.—According to despatches from this place, on May 27 high waters in the Fountain River carried away three large steel railroad bridges of the Santa Fe, the Missouri Pacific and the Colorado Southern roads.

Rat Portage, Ont.—The Ontario Government will build a bridge over the east branch of the Winnipeg River at this place.

Rome, N. Y.—It is said plans are being made for the South James street bridge and that the State Superintendent of Public Works will be ready to get bids early in June.

St. Joseph, Mo.—The County Court of Holt County will let seven bridge contracts on June 10.

St. Louis, Mo.—A steel bridge will be needed on the Eldorado & Bastrop Ry., an extension of the Missouri Pacific, where it crosses Ouachita River. It will be a draw structure with quite extensive approaches.

Salem, Ill.—We are told that bids will soon be wanted by the City Council for a bridge over Town Creek. J. N. Chance, City Clerk.

Vicksburg, Miss.—Bids are wanted June 2 for a steel bridge on road No. 35. J. D. Laughlin, Clerk.

Wabash, Ind.—Bids are wanted June 2 for five county bridges. B. F. Clemans, County Auditor.

Winchester, Ind.—Bids are wanted June 2 for some county steel bridges. John Miller, County Commissioner.

Other Structures.

Angels Camp, Cal.—The Osborn Engineering Co., Cleveland, Ohio, is making plans for a machine shop, foundry, blacksmith shop and other buildings for the Angels Iron Co.

Belvidere, Ill.—We are told that the Chicago & North Western contemplates the following improvements at Belvidere: Sixteen-stall engine house, standard plan; stalls 84 ft. deep with standard 70-ft. steel turn-table, standard cinder-pit and standard three-pocket coaling chute of the under-cut gate type. Contracts for this work have not yet been let.

Braddock, Pa.—New works are to be built at Braddock by the Sterling Steel Foundry Co., of Pittsburgh. The main building will be of steel construction 120 x 400 ft. The capacity of the plant will be 600 tons per month. The officers are: S. J. Wainwright, Jr., President; H. E. Wainwright, Jr., Secretary, and Uriah Tinker, Treasurer.

Brantford, Ont.—The Osborn Engineering Co., of Cleveland, Ohio, will make plans and specifications for the building and equipment of a plant for the Cockshutt Plow Co. at Brantford.

Connellsville, Pa.—The Baltimore & Ohio has been asking for bids for increasing the yard facilities at Connellsville to handle 3,300 cars. The improvements will include a 22-stall roundhouse, machine, boiler and blacksmith shops, engine house, coal trestle and electric lighting plant.

Louisville, Ky.—The Louisville Bolt & Iron Co. has increased its capital stock from $150,000 to $350,000. The plant of the company, which was located near Third and N streets, was destroyed by fire about three months ago and new buildings are now being erected. Mr. Taylor, President of the company, is said to be buying equipment.

Montreal, Que.—Local reports state that progress has been made with plans for the proposed Canadian Pacific shops in Montreal, and that bids will be wanted in the near future.

Pittsburgh, Pa.—Jones & Laughlins, Ltd., have just let a contract for two acid open-hearth furnaces in the Soho furnace plant. The new furnaces will have a capacity of 25 tons a day.

Portage La Prairie, Man.—Local reports say that it is understood that the Canadian Northern, in the near future, will build a $16,000 station building in this city.

Pottstown, Pa.—It is said plans are being made by the Philadelphia & Reading for a new passenger station in this town to cost $10,000.

Ruston, Ark.—The railroad shops of the Arkansas Southern at this place were destroyed by fire on May 2[illegible].

St. Paul, Minn.—The St. Paul Terminal & Transfer Co. has been organized to build a terminal line in

St. Paul, with freight depots. Robert Williams is President.

SAYVILLE (L. I.), N. Y.—The Long Island R. R. will soon begin work on the proposed new $10,000 station in this place.

SCRANTON, PA.—A local paper reports that plans for the Delaware, Lackawanna & Western shops, which are to be built on the Bloomsburg Division between Bellevue and Taylor, are finished, and that work will be begun so that the plant will be in working order within two years.

SHARON, PA.—The Stewart Iron Co., Ltd., will build a plant at this place to make cement.

UTICA, N. Y.—A new repair and machine shop is to be built by the Utica & Mohawk Valley Ry. in Utica. The new building will be of brick and steel and will be 225 ft. long and 51 ft. wide.

VICKSBURG, MICH.—The Grand Rapids & Indiana Ry. and the Grand Trunk have agreed upon plans for a union station in this city.

WINNIPEG, MAN.—The Canadian Northern has announced improvements to the shops at Winnipeg at an outlay of nearly $500,000.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page xviii.)

General Baggage Agents.

The American Association of General Baggage Agents held its annual meeting at Chicago, last week. The President of the Association for the ensuing year is Mr. J. A. Osborn, of the Illinois Central, Chicago; and the Secretary is Mr. J. E. Quick, of the Grand Trunk, whose address is now Toronto, Ontario.

The Electric Club (Wilkinsburg, Pa.).

At the meeting on Tuesday, May 27, the subject was "Induction Motors," by Mr. R. E. Gilman, followed by a general discussion. There was also a discussion on "Elementary Dynamo Electricity."

On Thursday, May 29, Mr. W. J. Bothwell, Chairman of Section 6, read a paper on "Detail Engineering."

"Parallel Operation of Alternators" was the subject of Mr. P. M. Lincoln on Wednesday evening, May 28. Mr. Lincoln was formerly connected with the Cataract Construction Company at Niagara Falls, N. Y.

PERSONAL.

—Mr. F. B. Goodrich, General Manager of the Houston, East & West Texas, died at Marlin, Texas, May 17, aged 32 years. He was formerly Chief Engineer of this company.

—Mr. E. H. McHenry has been appointed Chief Engineer of the Canadian Pacific, to take effect June 1. It will be remembered that Mr. Peterson recently retired to the position of Consulting Engineer. Last October, on the occasion of Mr. McHenry's resignation from the Northern Pacific, we published a short sketch of his career with a photograph, and it is hardly necessary to repeat that now. However, we can heartily congratulate the Canadian Pacific on securing his services.

—Mr. H. Miller's entire railroad service has been with the Burlington road. Mr. Miller is the new Superintendent of the St. Louis, Keokuk & Northwestern, and the Chicago, Burlington & Kansas City. Beginning as a water-boy in the track department he gradually rose through the subordinate positions of switchman, brakeman, conductor and yardmaster, becoming Trainmaster in 1890. Two years later he was promoted to the position of Assistant Superintendent and held that position until his recent promotion to the superintendency.

—It has been announced and denied, and now we believe it is official, that Mr. George B. Francis is to take a position in New York in special charge of the station work of the Pennsylvania in its new entrance to Manhattan Island and Brooklyn. Mr. Francis is now Chief Engineer of the Union Railroad and the Rhode Island Suburban Railway in Providence, R. I. He achieved great credit as engineer of the new South Terminal Station in Boston, during its design and construction, and prepared a most admirable account of that work for the Transactions of the American Society of Civil Engineers.

—Mr. S. T. Park, Division Master Mechanic of the Southern California, was formerly Division Master Mechanic of the Santa Fe Pacific. He was born in 1868, and was educated at the Elizabethtown College, Kentucky. His first railroad service was with the Louisville & Nashville as clerk to the Master Mechanic at East Nashville, Tenn. Mr. Park remained with this company in different capacities until 1893, when he became Division Foreman of the Louisville, New Albany & Chicago, and its successor, the Chicago, Indianapolis & Louisville. Mr. Park was appointed Division Master Mechanic of the Santa Fe Pacific two years ago.

—We printed last week a portrait of Mr. W. S. Morris and a little sketch of his career. Mr. Morris has just been appointed Mechanical Superintendent of the Erie Railroad. In the paragraph published last week we said that he had been appointed Mechanical Engineer. The title was correctly given in the department of elections and appointments in an adjoining column. Invitations were sent out to a banquet to be given to Mr. Morris at the Commonwealth Club, in Richmond, last Monday night. These were signed by Mr. Stevens, Mr. Doyle and Mr. Joseph Bryan. This alone will suggest the consideration in which he is held by his associates in Richmond.

—The new Superintendent of the Wellston Division of the Cincinnati, Hamilton & Dayton, Mr. C. E. Vorhis, was born near Middletown, Ohio, in 1862. At the age of 19 he entered the service of this company as a clerk at Carlisle, and while there learned telegraphy. In October, 1882, he took the position of telegraph operator, working at various places on the road, until 1886, when he went to the Car Accountant's office in a similar position. In 1887 he was made Train Despatcher and was subsequently made Chief Train Despatcher, Trainmaster and finally became Division Superintendent. As will be seen Mr. Vorhis' entire railroad service has been with this company.

—Mr. Eugene C. Spalding, Vice-President of the Atlanta, Knoxville & Northern, died at his home in Atlanta, Ga., May 25. Mr. Spalding was born Jan. 16, 1862, and had been in railroad service since 1878. He became Car Accountant of the Western & Atlantic in 1883, and in 1889, was elected President of the International Association of Car Accountants. Since that time he has been known as a writer in the railroad journals, especially on matters relating to car service. In 1894 Mr. Spalding was Receiver of the Atlanta & Florida, and in 1896 of the Marietta & North Georgia. When the latter road was reorganized as the Atlanta, Knoxville & Northern Mr. Spalding was elected Vice-President, and so remained until his death.

—Mr. H. A. Fergusson, who on May 12 last became Assistant Superintendent of Motive Power of the Chicago Great Western, is a native of Pennsylvania, having been born in Philadelphia in 1869. For several months, during 1888, he was with the Baldwin Locomotive Works, entering the Pennsylvania Railroad as a special apprentice in October of that year. In 1893 he was appointed Assistant Foreman, becoming Assistant Master Mechanic at Jersey City two years later. In 1898 he was made Assistant Road Foreman of Engines, and in 1900 he became Assistant Engineer of Motive Power. In February, 1902, Mr. Fergusson went to the Chicago Great Western as General Shop Foreman at Oelwein, Iowa, and the following May was appointed to his new position as stated above.

—Mr. H. W. Thornton, who in March last became Division Superintendent of the Cleveland, Akron & Columbus, was born at Logansport, Ind., in 1871. In 1894 he was graduated from the University of Pennsylvania (Civil Engineering Department) and entered the service of the Pennsylvania Company December 14 of that year as a draftsman in the Chief Engineer's office of the Pittsburgh, Cincinnati, Chicago & St. Louis. The following year (1895) he was made Assistant Engineer of Construction of the Cleveland & Marietta. In April, 1896, he returned to the office of the Chief Engineer and was assigned a position as Topographer. He was later assigned to special work for the General Manager. In November, 1900, he was made Engineer Maintenance of Way of the Erie & Ashtabula Division, and in 1901 became Superintendent of the Marietta Division, from which position he was transferred to the Superintendency of the Cleveland, Akron & Columbus.

ELECTIONS AND APPOINTMENTS.

Baltimore & Ohio.—The jurisdiction of the officers of the Baltimore & Ohio Southwestern has been extended over the line between Midland City and Columbus, exclusive of Columbus Terminals, and the jurisdiction of the officers of the B. & O. has been extended over the line between Marietta and Belpre, known as the Marietta Branch.

Baltimore & Ohio Southwestern.—See Baltimore & Ohio.

Bismarck, Washburn & Great Falls.—C. P. Eckels has been appointed General Manager, with headquarters at Bismarck, N. Dak., succeeding Edwin C. Washburn, resigned.

Boston & Albany.—W. R. Robeson, General Superintendent, with headquarters at Springfield, Mass., has resigned, effective June 1.

Canadian Pacific.—E. H. McHenry, formerly Chief Engineer of the Northern Pacific, has been appointed Chief Engineer of the C. P., with headquarters at Montreal, Que., effective June 1.

Chicago, Lake Shore & Eastern.—S. M. Rogers has been appointed Purchasing Agent of this company and the Elgin, Joliet & Eastern, with headquarters at Chicago, Ill., succeeding R. A. Dugan, resigned, and the office of Assistant to the President has been abolished.

Chicago, Rock Island & Pacific.—A change in the organization of this company, affecting the maintenance of way department, is to be inaugurated on June 1. By its adoption the Chief Engineer will be relieved of the supervision of maintenance of way matters, and these duties will in future devolve upon the Division Superintendents. Each Superintendent will have charge of the track, roadbed, sidings and yards on his division, and will be held responsible for their condition. Division Superintendents will report up to the two General Superintendents, the latter in turn reporting to the General Manager. Thus maintenance of way is to be placed in the General Manager's hands. The Division Superintendents east of the Missouri River will report to General Superintendent W. M. Hobbs at Chicago; those west of the river to General Superintendent H. S. Cable at Topeka, Kan.

Chicago Terminal Transfer.—H. S. Hawley having resigned as Treasurer and Assistant Secretary, H. H. Hall has been appointed Acting Treasurer and Acting Assistant Secretary. The position of Traffic Manager has been abolished. W. B. Barr, heretofore General Freight Agent, has been appointed General Freight and Passenger Agent.

Chihuahua & Pacific.—George F. Tilton, Superintendent of Motive Power, has resigned to take a position with the El Paso Foundry & Machine Company, of El Paso, Texas, effective June 1.

Denver & Rio Grande.—F. R. Rockwell, Superintendent of the Rio Grande Junction, has been appointed Superintendent of the Second and Third Divisions of the D. & R. G., with headquarters at Salida, Col., succeeding R. M. Ridgway, resigned.

Elgin, Joliet & Eastern.—See Chicago, Lake Shore & Eastern.

El Paso & Rock Island.—H. Alexander has been appointed Superintendent of Terminals.

Houston & Shreveport.—See Houston, East & West Texas.

Houston East & West Texas.—J. N. Miller has been appointed Manager of this company and the Houston & Shreveport, with headquarters at Houston, Texas, succeeding F. B. Goodrich, deceased.

Louisiana & Northwest.—W. J. Raef has been appointed General Freight and Passenger Agent, with headquarters at Gibsland, La.

Milwaukee, Benton Harbor & Columbus.—F. M. Steel has been elected President, succeeding A. A. Patterson, Jr., resigned.

Minneapolis & St. Louis.—J. W. Mackay has been elected a Director, succeeding the late Wm. Strauss.

Minneapolis, St. Paul & Sault Ste. Marie.—C. P. Eckels, Superintendent at Enderlin, N. Dak., has resigned. (See Bismarck, Washburn & Great Falls.)

National R. R. of Mexico.—At a meeting of the Board of Directors held May 22, E. N. Brown, Third Vice-President, was elected Second Vice-President, succeeding Gabriel Morton, resigned; J. M. Frazer, Assistant Treasurer, succeeds Mr. Morton as Treasurer, effective June 1; and William Burckel, Assistant Secretary, becomes Secretary, succeeding George H. Smith, resigned, effective May 22. The offices of Third Vice-President and Assistant Treasurer in the City of Mexico and the office of Assistant Treasurer in New York will remain vacant.

New York & Ottawa.—H. K. Gays, Assistant General Passenger Agent, has resigned.

New York Central & Hudson River.—T. Behan has been appointed Supervisor of Track, with headquarters at N. Tonawanda, N. Y., succeeding T. Shea, deceased. B. M. McDonald succeeds Mr. Behan as Supervisor of Track at DeKalb Junction, N. Y., effective May 26.

Norfolk & Western.—John A. Pilcher has been appointed Mechanical Engineer, with headquarters at Roanoke, Va., succeeding Charles A. Seley, resigned. Mr. Pilcher was for several years Chief Draftsman for this company and for the last three years has been connected with the Baldwin Locomotive Works.

Pennsylvania.—On June 1, the Frederick Division of the company's lines will be abolished, and the roads now operated under the direction of that Division will be transferred to the control of the Northern Central and the Philadelphia, Wilmington & Baltimore. The position of Superintendent of this Division, held by Jos. B. Baker, Jr., will be abolished. The Division will be divided as follows: The York branch, which runs from Columbia to York, and the York, Hanover & Frederick road, which runs from York to Frederick, will be under the control of Superintendent H. W. Kapp, of the Northern Central. The Columbia & Port Deposit road, from Columbia, Pa., to Port Deposit, Md., will be transferred to the Maryland Division of the Philadelphia, Wilmington & Baltimore.

Pontiac Pacific Junction.—A. R. Creelman has been made President. H. B. Sims has been appointed Assistant Engineer, with headquarters at Ottawa, Ont.

Quebec Southern.—G. W. Bartlett, General Superintendent, with headquarters at Sorel, Que., has resigned.

Rio Grande Junction.—See Denver & Rio Grande.

Santa Fe Pacific.—A. B. Todd has been appointed Division Master Mechanic, with headquarters at Winslow, Ariz.

Tennessee Coal, Iron & R. R.—At a recent meeting the Directors elected: D. H. Bacon, Chairman and President; F. S. Witherbee, First Vice-President; Charles McCrery, Second Vice-President; L. T. Beecher, Secretary and Treasurer, and H. R. Sloat, Assistant Secretary and Treasurer.

Union Pacific.—J. F. Van Rensselaer has been appointed General Agent of the Freight and Passenger Departments, with headquarters at Atlanta, Ga., succeeding H. W. Nathan, resigned.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ALABAMA & TENNESSEE.—This company was incorporated in Alabama May 16, to build a line commencing at a point at or near Gadsden and running west through the Blount County coal fields through Cullman, Morgan and Lawrence Counties to a point at or near Florence on the Tennessee River. The Elliott-Chapman Coal & Iron Co. has purchased a large tract of coal lands in Blount County which will be reached by this line. The incorporators of the railroad are: E. R. Chapman, W. C. Van Antwerp, C. M. Bramley and S. W. Cushman, of New York, and others.

BALTIMORE & OHIO.—Bids have been asked for building new yards at Connellsville, Pa., to accommodate 3,300 cars. The improvements will include a 22-stall roundhouse and a number of shops. It is said that a new yard will also be built at Fairmont, W. Va., to accommodate 2,000 cars and to be likewise equipped with a 22-stall roundhouse and shops.

BEAUMONT, PORT NECHES & PORT ARTHUR (ELECTRIC).—According to most recent reports, 18 miles of grading have been completed on this new electric line in Texas between the points named, and thus part of the work will probably be completed in a week or so. The line which it is proposed to build will be about 20 miles long. S. M. Scott, of Beaumont, is interested.

BLUE CREEK & BELVA.—This company was incorporated May 21 in West Virginia, to build from the mouth of Blue Creek in Kanawha County, about 22 miles, southeast to Belva in Nicholas County. The incorporators are George R. Woodward, of Pennfield, Pa.; Preston Crowell, of Fairmont, W. Va., and others.

CANADIAN NORTHERN.—Surveys are reported for an extension east from Edmondton which is to be 30 miles long and run close to the International boundary. It is said that contracts will be let for this as soon as the surveys are completed, and that the line will be built this summer. (For general location map, see April 25, p. 315).

CANE BELT.—An officer writes in regard to reports of improvements undertaken in the near future, that a loop line about 10 miles long from Lakeside, Texas, to Bonus, is contemplated. From this the company expects to build a short branch to Garwood, on the Colorado River, about three miles distant. All material has been purchased for this extension and contracts for grading will be let within a short time. (May 2, p. 335).

CATAWBA VALLEY MINING & RAILWAY.—Announcement is made, under date of May 20, that work will begin at once on the proposed line which is to run from Roanoke to Salem, Va., and thence north to the Brush Mountains and New Castle, Va. The company owns large deposits of iron, sandstone and coal. Louis A. Scholz, of Roanoke, Va., is President.

CHESAPEAKE & OHIO.—Bids to extend the Guyandotte Valley are now being received by the Chesapeake & Ohio. The Guyandotte Valley is now in operation between Huntington, W. Va., and Midkiff, a distance of 36 miles.

Surveys are reported for an extension of what is known as the Alberene R. R. from its present terminus at Alberene, Va., to some point on the Chesapeake & Ohio, either at Charlottesville or at some point between Charlottesville and Gordonville, Va., a distance of about 12 miles.

COLUMBIA RIVER & NORTHERN.—Contract was let May 15 for the first 15 miles of track between Goldendale, Wash., and Swale Canyon, to Axtell Anderson. Rails for this line were ordered in Germany and are now on the way. (May 16, p. 372).

COPPER RANGE.—Work is reported begun on the extension from Houghton, Mich., to Calumet, a distance of 15 miles. The contractor is C. J. Johnson, who has sublet the work. Contract for the bridges has been let to the Wisconsin Bridge & Iron Co., of Milwaukee. The Portage Lake bridge will be enlarged and six steel crossings will be built. (April 11, p. 277).

DENVER & NORTHWESTERN.—Purchase is reported of five acres of land in Denver, Colo., to be used for freight and passenger yards by this new line which is to be built from Denver to Salt Lake City. D. H. Moffatt and Senator Clark are the chief projectors. (May 16, p. 372).

GALESBURG & KEWANEE ELECTRIC.—This company filed articles of incorporation in Illinois May 20, with the object of building an electric road from Galesburg to Kewanee, a distance of about 35 miles. The Chicago, Burlington & Quincy would be paralleled by the proposed route. The incorporators and first board of directors are H. W. Crane and W. E. Patty, of Oneida, Ill.; S. E. Robb, of Kewanee, and others.

Gaspe & Western.—This company's bill to acquire the Atlantic & Lake Superior and the Baie de Chaleurs, and for an extension of time in which to build the section from Paspebiac to Gaspé Basin, Que., has been rejected by the Senate Committee, and the Government has been asked to extend the Intercolonial to Paspebiac, on the Baie de Chaleurs, making use of the Atlantic & Lake Superior tracks for this purpose, and thus obtaining an open all-the-year-round ocean port. (May 2, p. 336).

Grand Trunk.—It is said that a short spur line will be built from Berlin, Ont., to the factory of the Ontario Beet Sugar Co., and from that point to Bridgewater, at a cost of about $18,000.

Greene County.—An officer writes that this proposed line from Washington, Washington County, Pa., to Fayette, Greene County, 25 miles, will be operated by steam, and that surveys are under way. Beyond this nothing has as yet been decided as to the exact route, etc., and it is not known when contracts are likely to be let. James T. Blair, of Greenville, Pa., is President.

Hearne & Brazos Valley.—In regard to projected extensions in Texas, an officer writes that surveys have been made from Stone City down the Brazos River, but these are only preliminary and it is thought best not to give the proposed route as no definite decision has yet been reached. (March 28, p. 235).

Illinois Southwestern.—This company was incorporated in Illinois May 21, to build a railroad from a point in Crawford County, through Jasper, Richland, Wayne, Hamilton, Franklin, Williamson, Perry, Union, Pulaski and Alexander Counties to a point in Jackson County. The incorporators and directors are Delevan A. Holmes, Evanston, Ill.; L. C. Whitman, of Chicago, and others.

Indiana Creek Valley.—Incorporation was granted May 21 to a company proposing to build a railroad from a junction of Indiana Creek and Mill Run, to a point in Springfield Township, entirely within Fayette County, Pa., a distance of four miles. Wm. A. Kalp, of Mt. Pleasant, Pa., is President.

Jackson & Battle Creek Traction.—This company has been incorporated in Michigan to build an electric road from Jackson to Battle Creek, a distance of 42 miles. The line, if built, will parallel the Michigan Central.

Kansas City, Mexico & Orient.—The profile of the located portion of the route through Presidio County, Texas, has been filed with the Railroad Commission. According to most recent advices, about 60 miles of grade are now completed and ready for the rails. Thirty miles of this extends south from the Red River, and 30 miles north from Sweetwater, Texas, where the Texas & Pacific R. R. is crossed. The Texas Division of this line will be known as the Panhandle & Gulf, incorporation having been granted in the State under that name.

Laramie, Hahn's Peak & Pacific.—An officer writes that this line will run west from Laramie, Wyo., by way of Centennial, 35 miles through Holmes and Goldhill. The exact route beyond Goldhill and Holmes has not yet been determined. Twenty-three miles of this line has already been graded and surfaced ready for ties, and the contractor is now finishing the plans of the grade which will complete the first division from Laramie to Centennial. This will require 60 days or more. Culverts are all in and bridges are being built as fast as possible. Contract has been let for the first 100 miles of the line, and includes grading, track laying and equipment. About 100,000 ties have been cut along the line and are now being delivered along the completed grade. The road is being built on a common stock basis, with no preferred stock or bonds, stock having been issued at the rate of $90,000 par value per mile. Isaac Van Horn, 7 Congress street, Boston, Mass., is President.

Lordsburg Mineral.—This company has been incorporated in New Mexico to build a spur track to reach every producing mine in the hills of the Lordsburg District. C. W. Maxon, of Stein Pass, N. Mex., is President.

Manistee & Northeastern.—An officer writes that work is in rapid progress on this new line between Traverse City, Mich., and Provemont, on the Leelanau Peninsula, a distance of about 25 miles. Right of way has been secured over the entire route and it is expected that the grading will be completed by July 1, and that the line will be in operation by the first of September. Work is now being done on the section between Cedar City and Provemont. (Construction Supplement, March 14, 1902).

Mexican International.—An officer writes in regard to frequent reports as to the building of an extension from Durango to Mazatlan, and from Jaral to Saltillo, Mexico, that locations have been made for these two lines but no orders to build have yet been received from the owners.

Mexico Roads.—Concession has been granted by the Mexican Government to Dwight Furness, of the City of Mexico, to build a short spur line between Acatlan, on the Guadalajara Division of the Mexican Central, to the town of Jamay.

Middleboro Mineral.—Amended articles of incorporation were filed in Kentucky May 19 providing for an extension from a point on Yellow Creek, in Bell County, through Bell and Harlan Counties to the headwaters of Clover Fork of the Cumberland River, in Harlan County. Work was begun last January on a stretch of this new line eight miles long, to develop coal lands in the mountains of Bell County. The total length of the proposed line, as now provided for, is about 100 miles. J. H. Bartlett, of Middleboro, Ky., is President.

Minneapolis, St. Paul & Sault Ste. Marie.—An officer writes in regard to the proposed extension from Braddock, N. Dak., to Bismarck, 40 miles distant, that contract has been let to Halverson, Richards & Co., of Minneapolis. This work consists in the main of repairing an old grade made 13 years ago. The maximum grade is .8 of 1 per cent.; maximum curvature, 3.3 deg. There are no span bridges. (May 9, p. 354).

Monte Ne.—This company has been chartered in Arkansas to build a railroad four miles long from Monte Ne, Ark., to a connection with the St. Louis & San Francisco at Lowell. W. H. Harvey, of Little Rock, is interested.

Nashville, Chattanooga & St. Louis.—Surveys are reported in progress for an extension to Greenplace, Tenn., where coke ovens are to be located, and it is said that work will begin as soon as the route is determined. The length of this extension will be about 10 miles. (See also item in our issue of April 11, p. 278).

New York, New Haven & Hartford.—Contract has been let to C. W. Blakeslee & Sons, of New Haven, for a cut-off four miles long, double-track, between North Attleboro and Adamsdale, Mass. The work will take several months and the estimated cost is about $160,000.

North American Copper.—This company has been recently incorporated in Colorado, and proposes to engage in mining, and also to build a railroad 150 miles long from Walcott, on the Union Pacific in Wyoming, to the mouth of Elkhead River, in Routt County, Colo., along the valley of the North Platte River and of the Elkhead.

Oley Valley Electric.—This line, extending between Reading and Boyertown, Pa., 20 miles, was opened for business May 20.

Pennsylvania.—Contracts in connection with the grading and masonry work on the double-tracking of a portion of the Philadelphia & Erie have been let as follows: Section No. 1, from Nisbet to Jersey Shore, to Thomas F. Kerns & Son, of Pottsville; No. 2, from the east end of Keating bridge to mile post No. 175 west of Round Island, to Miller & McGraw, of Philadelphia; No. 3, from mile post No. 175 to mile post No. 168 at Driftwood, to McMenamin & Sims, of Philadelphia; No. 4, from Driftwood to mile post No. 163, west of Huntley, to C. A. Sims & Co., of Philadelphia; No. 7, from mile post No. 175 to Emporium Junction, to A. F. Chapman & Co., of Buffalo. Sections 5 and 6 are yet to be awarded.

Pere Marquette.—It is reported that estimates have been made on the cost of a line from Buffalo to St. Thomas, and that negotiations are pending for the purchase of the Lake Erie & Detroit River operating between St. Thomas and Sarnia, opposite Port Huron. The improvements under consideration involve building approximately 200 miles of new track.

Queens (Electric).—This company was incorporated at Albany May 22, to build an electric road 21 miles long in the former towns of Flushing, College Point, Whitestone and Jamaica, now portions of the Borough of Queens, New York City. The capital stock is $2,500,000, and the directors are E. C. Miller, Francis Rawle and Wm. W. Shelmerdine, of Philadelphia, and others.

Raleigh & Cape Fear.—Work is reported in progress on an extension 20 miles long in a southerly direction from Sippahaw, N. C. The road is now 21 miles long and extends between Sippahaw and Raleigh.

Red Canyon.—Articles of incorporation for this company were filed at Keystone, S. Dak., May 17. It is proposed to build a road nine miles long through Red Canyon in Fall River County, South Dakota, for the purpose of hauling ore. Geo. A. Clark, Chas. J. Patton and others are the incorporators.

Rockland County Traction.—Incorporation has been granted this company in New York to build an electric railroad 30 miles long in the villages of Upper Nyack, Nyack and South Nyack, and the towns of Orangetown and Clarkstown to Rockland Lake.

St. Paul Terminal & Transfer.—This company has been incorporated in Minnesota, with a capital of $150,000, with the object of furnishing connection into South St. Paul to the Burlington, Cedar Rapids & Northern.

Santa Ana & Long Beach.—It is reported that a new company has taken over the franchise of this proposed steam line, 25 miles between the points named, in the southern part of California, and will build an electric road over the right of way.

Seaboard Air Line.—This company has been granted permission to enter Birmingham, Ala. The route is by way of Rockmart, Ga., making the distance from Atlanta to Birmingham, 177 miles, with a 1 per cent. grade. The line of the East & West R. R. will be used and entrance into Birmingham is effected on the tracks of the Birmingham & Atlanta Air Line, which has been partially surveyed. Charter for this company was granted last week, and at an election held subsequently Messrs. Williams, Middendorf and Barr, of the Seaboard Air Line, were placed on the Board of Directors.

Southern Pacific.—Contract has been let for three tunnels, grading and masonry work, near Osino, Nev. This is in connection with the important work in progress on the Central Pacific line in that vicinity which has been in progress for some time.

Texas & Louisiana.—A meeting of the directors is to be held shortly to consider amending the company's charter to provide for an extension 22 miles long from Donovan, Texas, to Natchitoches. The line is at present in operation between Lufkin and Long Leaf, Texas, 19 miles.

Texas & Pacific.—An officer sends the following information about the extension from New Roads, La., along the right bank of the Mississippi. The line was completed from New Roads to the crossing of the Red River some time ago, and regular freight and passenger service was established about the first of April. From Red River north to Concordia, where the line will connect with the New Orleans & Northwestern, 46 miles distant, the grading is nearly completed and track laying will begin as soon as the bridge over Red River is completed. The piers for this were finished several months ago, but work has been delayed on account of the non-arrival of steel for the bridge and because of the prevailing high water in the river. The Missouri Valley Bridge Co. are the contractors. Track laying and other work in connection with building the railroad will be handled by the company's forces. The line is almost a continued tangent, with a grade of .3 of 1 per cent. Rails and equipment have been ordered.

Trenton & New Brunswick (Electric).—According to most recent advices, this line, which was incorporated under a steam railroad charter, but will be operated by electricity, has been graded for about 12 miles of its entire length of 23, and five miles of track have been laid. It is thought that it will be in operation during August. The company owns right of way 100 ft. wide, and as at present planned the line will have but three curves its entire length. (Construction Supplement, March 14, 1902).

United Railroads (San Francisco).—Work is reported in progress filling the 10-mile gap in this electric line between San Francisco and San Mateo, Cal.

Valdez, Copper River & Yukon.—Incorporation was granted this company in New Jersey May 23, to build a railroad from Valdez, on the Gulf of Alaska, to Eagle City, on the Yukon, and from the Yukon to Behring Strait. The general purpose of the company, as set forth in the articles, is to build in Alaska.

Virginia Roads.—Work is reported in progress on a new line which is being built to the iron properties of James A. Frazier near Rockbridge Alum Springs.

Warren & Jamestown Electric.—This company was incorporated in Pennsylvania May 20, to build an electric road 12 miles long from a point in Glade Township, Warren County, to a point on the New York State line in Pine Grove Township, Warren County.

Western Arkansas Midland.—This company has been incorporated in Arkansas, with a capital of $740,000, to build a railroad from Hot Springs southwest to Ophir, Montgomery County, a distance of 37 miles.

GENERAL RAILROAD NEWS.

Chicago, Indianapolis & Louisville.—The terms of agreement in accordance with which this property will come under joint control of the Southern and the Louisville & Nashville are as follows: A joint 4 per cent. bond will be offered in exchange for the stock of the Chicago, Indianapolis & Louisville at the rate of 78 for the preferred. An option including a part payment in cash for the common stock goes with this. The bonds will be secured by a deposit of stock in trust, and they are a joint liability of the Southern and the Louisville & Nashville, so that either will be liable for any failure on the part of the other to meet the obligation. The Chicago, Indianapolis & Louisville, however, will continue to be operated as an independent property. (May 23, p. 386).

Cincinnati, Dayton & Toledo Traction.—This company was incorporated in Ohio May 19, with a capital of $5,000,000, as a consolidation of the Southern Ohio Traction and the Cincinnati & Northwestern Railroads. The Southern Ohio Traction Co. is a consolidation of the Cincinnati & Hamilton Electric Street Ry., the Miami Valley Traction and the Dayton Traction Companies. It operates 53 miles of track.

Denver, Lakewood & Golden.—This road, which runs between Denver and Golden, Colo., 13 miles, has been ordered sold under foreclosure to satisfy the claims of the bondholders and other creditors in a suit brought in the name of the Farmer's Loan & Trust Co. W. W. Borst, Denver, Colo., is receiver. This line, which is a standard gage, was chartered in 1890 and completed in 1892. Between Barnum Junction and Barnum, Colo., three miles, it is operated by electricity.

Detroit & Mackinac.—At a recent meeting of the directors four resigned and others elected to fill their places represent a syndicate of which President McHarg, of the Manhattan Bank, is President. The line was originally known as the Detroit, Bay City & Alpena, but was reorganized in 1895. The system embraces 325 miles of road, which does a large lumber business.

New Orleans Railways.—The different street railroad and lighting interests in New Orleans are to come under the common control of a company with the above title. The properties acquired are seven in number, with a total of $19,550,000 common stock, $7,100,000 preferred stock, $3,500,000 retirable bonds, and $12,846,000 bonds which are not retirable. The total mileage operated is 178. According to the terms of the agreement, the acquired stocks and bonds are to be deposited under a new $40,000,000 4½ per cent. mortgage. It is estimated that by the reduction of operating expenses which will be effected by a consolidation of the power houses and shops, etc., the general expenses will be lowered about $265,000 annually, and the expected increase in gross receipts, based upon what the properties have done in the past, should be 10 per cent. yearly, or more.

Nova Scotia Central.—Mackenzie & Mann are said to have secured control of this road, which runs between Lunenburg and Middleton, N. S., 70 miles. The line has been in operation for a number of years, but has been in liquidation and has recently been held by the Halifax Banking Co. It connects with the Dominion Atlantic at Middleton, and with the proposed South Shore line between Halifax and Yarmouth and Bridgewater. Mackenzie & Mann are under contract to the Nova Scotia Government to build the last named.

Pennsylvania.—On and after June 1, the Frederick Division will be merged into the Pennsylvania and Northern Central roads. The chief effect of the change will be to reduce the offices. A line between York and Frederick, Md., will be under the jurisdiction of the Superintendent of the Northern Central, and between York and Columbia the line will be merged with the Philadelphia Division under Superintendent Gucker. The Columbia & Fort Deposit branch of the present Frederick Division will be attached to the Maryland Division of the Philadelphia, Wilmington & Baltimore.

Pennsylvania & Mahoning Valley (Electric).—This company was incorporated May 23, under the laws of Pennsylvania, with a capital stock of $8,000,000, as a consolidation of the Trumbull Electric, Mineral Ridge, Mahoning Valley, New Castle & Lowell, New Castle Traction, Lawrence Gas and New Castle Electric Companies, and controlling about 90 miles of track between New Castle, Pa., and Leavittsburg, Ohio. M. A. Verner, of Pittsburgh, is President; James Parmelee, of New York, is Vice-President, and A. A. Anderson, of Youngstown, Ohio, General Manager.

South & Western.—The stockholders will vote June 25 on the proposition to purchase the property of the Ohio River & Charleston and of the South & Western of North Carolina. The South & Western R. R. of Tennessee was incorporated last year and absorbed, last April, the Virginia company of the same name. The Ohio River & Charleston is now in operation between Johnson City, Tenn., and Caney River, N. C., 33½ miles, and has 80 miles additional graded.

Southern.—Announcement is made that the Atlantic, Valdosta & Western has been purchased. The main line extends from Jacksonville, Fla., to Valdosta, 110 miles, with branches which bring the total mileage to 155. It also owns valuable terminals in Jacksonville.

Staten Island Electric.—The reorganization plan referred to in our issue of May 23 includes the authorization of $2,500,000 first and collateral trust mortgage, $1,925,000 of which is to be applied in exchange for existing securities. Two hundred and twenty thousand dollars is to be sold with a large amount of outstanding stock, $55,000 is reserved for reorganization or treasury purposes, and $300,000 reserved for the acquisition of new property. The issue of capital stock which is to be represented by voting trust certificates issued by the Guaranty Trust Co. for five years, will be $3,000,000, $2,138,750 of which will be exchanged for existing securities. Seven hundred and thirty-two thousand dollars will be sold with bonds, as above stated, for $438,880 cash, and $128,250 will be reserved for purposes of reorganization, or to be retained in the treasury.

Wabash.—Announcement is made that the Ann Arbor R. R. and ferries have been purchased by a syndicate in the interest of the Wabash. The Ann Arbor operates 291 miles from Toledo, Ohio, to Frankfort, Mich., and connection with the Wabash can be arranged in Toledo. President Ramsay is quoted as saying that the purchase has been carried through not as a Wabash project, but as an investment venture by a syndicate, some of the members of which are in close sympathy with the above. Enough stock has been purchased to make control of the road certain and the general scheme of holding will be similar to that of the Western Maryland.